C
K13m pZ7I
1915

UNIVERSITY OF ILLINOIS LIBRARY
DEC 27 1920

VOL. XI | No. 1

Kansas
State Manual Training Normal School

A COLLEGE FOR TEACHERS, EMBRACING ALL THE GENERAL, INDUSTRIAL AND VOCATIONAL COURSES.

INDUSTRIAL ARTS NUMBER.

1915

UNIVERSITY OF ILLINOIS
SEP 3 1915

FEBRUARY, 1915

PRESIDENT'S OFFICE

Published Quarterly
BY
STATE MANUAL TRAINING NORMAL SCHOOL
PITTSBURG KANSAS

Entered May 6, 1905, at Pittsburg, Kan., as second-class matter, under act of Congress of July 6, 1904.

Vol. XI No. 1

Kansas
State Manual Training
Normal School

A COLLEGE FOR TEACHERS, EMBRACING ALL THE GENERAL, INDUSTRIAL AND VOCATIONAL COURSES.

INDUSTRIAL ARTS NUMBER.

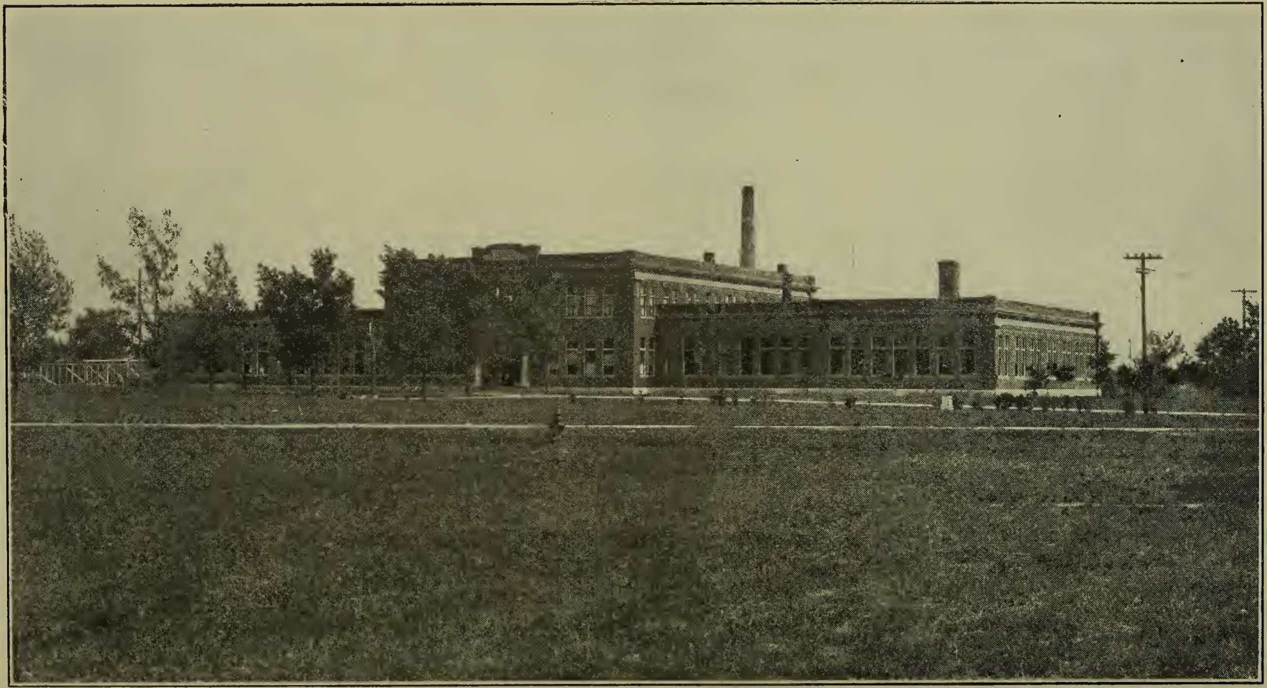
FEBRUARY, 1915

Published Quarterly
BY
State Manual Training Normal School

PITTSBURG, KANSAS

KANSAS STATE PRINTING OFFICE.
W. C. Austin, State Printer.
TOPEKA, 1915.
5-5785

Entered May 6, 1905, at Pittsburg, Kan., as second-class matter, under act of Congress of July 6, 1904.



Industrial Arts Building.

CONTENTS.

page
Calendar 4
Introduction 7
Special Information 8
Outline of Industrial Arts Courses 10
Woodwork 13
  General 13
  Bench Work 15
  Cabinetmaking, Elementary 19
  Wood Turning 17
  Pattern Making 21
  Cabinetmaking 21
  Carpentry and Mill Work 23
  Survey of Industries 24
  Wood Finishing 25
  Farm Building 27
  Cement Work 27
  Industrial Education 29
  Special Methods 29
  Tool Sharpening 29
  Equipment 30

High School:

  Manual Arts Course 35
  Woodwork 35

Metal Work:

  General 37
  Equipment 37
  Forging 39
  Bench Work and Elementary Machine 39
  Machine Shop 39
  Tool and Die Making 41
  Foundry 41
  Survey of Industries 41
  Farm Machinery 41
  Sheet Metal 43

Drafting:

  Mechanical Drawing 47
  Architectural Drawing 48
  Shop Sketching 50
  Shop Design 50
  Outline of Courses 52
Industrial Physics 57
Industrial Mathematics 59

CALENDAR, 1915-1916.

September 14, Tuesday	Fall semester opens.
November 15, Monday	Mid-semester term opens.
November 24-29	Thanksgiving vacation.
December 20, Monday	First Semester Musical Recital.
December 21, Tuesday	Contest in Dramatic Art.
December 21, Tuesday	Contest in Declamation.
December 22, Wednesday	Work closes for 1915.
January 4, Tuesday	Resumption of first semester's work, 1916.
January 24, Monday	Second semester opens.
March 31, Friday	Commemoration Day.
April 2, Monday	Spring term opens.
May 23, Tuesday	Annual Recital by Dept. of Music.
May 26, Friday	Contest in Oration.
May 26, Friday	Contest in Debate.
May 28, Sunday	Baccalaureate Address.
May 29, Monday, a. m	Commencement.
May 31, Wednesday	Enrollment for Summer School.
July 28, Friday	Summer School closes.

We are learning that industrial prosperity depends in the long run on a kind of efficiency that aggregations of capital, however imposing, cannot by themselves supply, and that in very many of the most desirable industries the secret of success is in the trained intelligence and disciplined taste of the man who does the work; that the development of these powers in the workmen of the future is an important branch of general education, and its active promotion and adequate support a legitimate public concern.

—*Leslie W. Miller.*

INDUSTRIAL ARTS FACULTY.

W. A. Brandenburg	President.
Lyle Brower	Director of Drawing and Design.
A. H. Whitesitt	Director of Woodwork.
A. Leonard Logan	Director of Metal Work.
J. G. Wilkins	Instructor in Shop Sketching.
W. O. Moore	Instructor in Mechanical Drawing.
F. H. Dickinson	Instructor in Woodwork and Foundry.
Chas. R. Wasser, Jr.	Instructor in Woodwork.
G. W. Trout	Director of Industrial History.
James A. Yates	Director of Industrial Chemistry and Physics.
J. A. G. Shirk	Director of Industrial Mathematics.
Vaughn B. Caris	Instructor in Industrial Mathematics.
S. L. Redman	Instructor in Industrial Physics.

THE SECRET OF SUCCESS.

By Thomas Dreier.

The secret of success is not a secret. Nor is it something new. Nor is it something hard to secure. To become more successful, become more efficient. Do the little things better. So work that you will require less supervision. The least supervision is needed by the person who makes the fewest mistakes. Do what you can do and what you should do for the institution for which you are working, and do it in the right way, and the size of your income will take care of itself. Let your aim ever be to better the work you are doing. But remember always that you can not better the work you are doing without bettering yourself. The thoughts that you think, the words that you speak, and the deeds you perform are making you either better or worse. Realize with Henley that you are the master of your fate and the captain of your soul. You can be what you will to be. Forget yourself in rendering service to others. If an employee, strive to make yourself of greater value to your employer. Look upon yourself as a manufacturer. Think of yourself as being in business for yourself. Regard yourself as a maker and seller of service, and ever bend your thought and your energies toward the improvement of your product. The wise manufacturer never injures his machinery willfully. Your body, your mind, your soul serve as your plant. Eat and drink only that which will nourish your body, entertain only those thoughts that will enrich your mind, and if you feed your body with the best physical food and your mind with the best mental food you will build up a service factory that will find its products in constant demand. The world is hungry for quality service. It wants to pay for it. It is paying for all it can get. The market is not crowded. There is a chance for you right now. There is a chance for you right where you are. The time to start is now. Your reward will take care of itself.

INTRODUCTORY.

The contents of this bulletin present in brief the scope of industrial work of the State Manual Training Normal School. The aim of the institution is the highest possible degree of efficiency in the industrial and technical courses offered and the most practical and vital application of both academic and industrial courses and subjects.

Perhaps in no other teachers' college is there greater effort toward a vital functioning and interfunctioning of the so-called cultural and industrial subjects.

Two-year courses leading to the normal diploma, which is a life certificate to teach in the public schools of Kansas, are offered in the following: Kindergarten Teachers, Primary Teachers, Grade Teachers, Rural Teachers, Special Language, Commerce, Agriculture, Drawing Supervision, Music Supervision, Manual Training, Domestic Science and Art.

Four-year courses leading to the college degree, with college major work in the following, are offered: Domestic Art, Domestic Science, courses in the Industrial Arts, Biology, English, History, Mathematics, Chemical and Physical Sciences, Education and Languages.

The Board of Administration has just authorized the introduction of the factory system and plan for shop work, by which all shop practice and work of students will be applied toward the production of articles for the market. The object of this plan being: A deeper interest; a more practical application; a broader experience; a better product; a financial remuneration for every student in his shop practice just as soon as he is able to do acceptable work. This plan, when thoroughly installed, should enable scores of young men to earn most if not all of their way through the institution.

The splendid new Industrial Arts Building is 135 feet by 286 feet. It is one of the largest and best-equipped buildings of its kind in the United States.

Eight specialists in their respective fields of industrial work give their entire time to the work of this department.

Never before has there been such a demand for well-prepared teachers of all lines of industrial and agricultural education. A new and most dignified position, for which there is at present an unsupplied demand, is that of director of industrial and agricultural education in our public-school systems.

We now have a national director for the promotion of industrial and vocational education; many states have created this position as a part of their educational systems. Counties, cities and towns are doing so at a surprisingly rapid rate. Thorough and complete courses preparing for every demand in this industrial scope of work are offered at all times.

While it is far better to enter at the beginning of terms, or quarters, students may enter and begin work profitably at any time.

For full particulars regarding the School, address

W. A. BRANDENBURG, *President*,
PITTSBURG, KAN.

SPECIAL INFORMATION

For Those Who Are Especially Interested in the Subject of Industrial Education.

ENROLLMENT.

Any one who wishes to fit himself to be a teacher or supervisor of industrial education will be permitted to enroll in any classes for which he may be qualified, and if he is deficient in any of the essential requirements for entrance he may be admitted conditionally as an unclassified student, pending the completion in residence, by examination or otherwise, of the prescribed subjects. Mature persons who have had professional experience in teaching, or skilled workers of superior intelligence, will be admitted to these courses upon satisfying the president of the School that they can carry on the work successfully. There are many skilled workmen who can fit themselves for fine positions in one or two terms of nine months each. In all such cases a personal interview is advised. Students who can present satisfactory evidence of having completed an approved high-school course or its equivalent will be admitted to full standing. Students who have had normal or collegiate training will be given credit for such work as they have satisfactorily completed.

ADVANCED STANDING.

Any one who has had practical experience in any lines of shop work which are taught in the courses will be enabled to take advanced standing, and all students are advised to secure such practical shop training before or in vacation periods during their school course.

A student who presents explicit and official certificates for advanced standing may be admitted to courses for life certificate, provided twenty weeks' work in actual residence work be done in this School and all professional and technical requirements called for in the regular course are completed before diploma is awarded.

TRADE INSTRUCTIONS FOR WORKMEN.

In addition to the technical instruction which is given for teachers of industrial education, the opportunity is also given to others who do not intend to teach but who wish to take advantage of the special technical courses offered by the School in perfecting themselves in their trades or vocations, for any intelligent workman may increase his efficiency by judicious training along the lines of his special trade, and the State Manual Training Normal offers these opportunities to the mechanics of many trades. Due credit and standing will be given in the technical course when the proficiency and knowledge of the workman warrants such recognition.

FEES.

No tuition is charged to students other than the enrollment fee of two dollars for a term of twenty weeks.

LIVING EXPENSES.

Room and board are as reasonable in cost as at any other school. The Normal cafeteria serves breakfast and supper to regular ticket holders at two dollars per week. Noon lunches are served to all students on the regular cafeteria plan, meat orders fifteen cents, side dishes one to five cents. Some students succeed in getting their meals here at a total cost of two dollars and a half per week, and others, by careful selection, for even less. Some students reduce living expenses by renting rooms and boarding themselves, while others work in private homes for their room and board.

EARNING.

Many students pay a portion of their school expenses by working in various employments, such as clerking, waiting on tables, newspaper work, janitor work, etc. It is the policy of the administration to give every possible opportunity to the student in the way of affording him employment. Most of the janitor work and general work on buildings, campus and school farm is done by the students.

LIBRARY.

The school library is unusually well equipped along the lines of industrial education, as the books have been selected by those who are specialists in their respective lines of work. All of the leading magazines dealing with industrial and vocational education, building, electricity, forge and foundry machinery are to be found in our library.

That man has a liberal education who has been so trained in youth that his body is the ready servant of his will, and does with ease and pleasure the work that it is capable of; whose intellect is a clear logic engine, ready to spin the gossamer as well as forge the anchors of the mind; one who is full of life and fire but whose passions are trained to come to heel by a rigorous will; the servant of a tender conscience; who has learned to love beauty, to hate vileness, and to respect others as himself. Such a one is in harmony with nature; they will get on together rarely.—*Huxley.*

Outline of Courses by Years.

The figure immediately after the subject indicates the number of the course; explanation of the work in the subject is found under this number in the later pages of this catalogue. The other figures indicate the number of semester-hours' credit given for the course.

INDUSTRIAL ARTS COURSE.

FRESHMAN YEAR.

First term:	*hrs.*
*Shop 1 or 2	4
Drawing 13	2
Industrial Mathematics	4
Physical Education 1, 9	2
*Electives	4
	16

*Elementary Forging, 4 hrs.; Chemistry, 4 hrs.; Physics, 4 hrs.; Biology, 4 hrs.; Agriculture, 4 hrs.; Psychology; Teaching; Library Methods, 1 hr.

Second term:	*hrs.*
*Shop 3 or 4	4
Drawing 14 or 15	2
English or Public Speaking	4
Management 1	2
*Electives	4
	16

*Farm Building Construction (19) 4 hrs.; Wood Carving, 2 hrs.; Forging, 4 hrs.; History, 4 hrs.; Agriculture, 4 hrs.; Biology, 4 hrs.; Industrial Mathematics, 4 hrs.; Chemistry, 4 hrs.; Physics, 4 hrs.; Psychology; Teaching; Library Methods, 1 hr.

SOPHOMORE YEAR.

First term:	*hrs.*
*Shop 5 or 6	4
Drawing 22	2
Psychology 2	4
Industrial Mathematics	2
*Electives	4
	16

*Millwrighting, 4 hrs.; Plumbing, 4 hrs.; Physics, 4 hrs.; Chemistry, 4 hrs.; Biology, 4 hrs.; Agriculture, 4 hrs.; Farm Blacksmithing, 4 hrs.; Descriptive Geometry (22), 2 hrs.; Wood Finishing, 4 hrs.; Library Methods, 1 hr.

Second term:	*hrs.*
*Shop 7 or 8	4
Drawing 16	2
Adolescence Problems 3	4
Industrial Education	2
*Electives	4
	16

*Cement Work (21), 4 hrs.; Tool Smithing, 4 hrs.; Printing, 4 hrs.; Descriptive Geometry (23), 2 hrs.; Physics, 4 hrs.; Agriculture, 4 hrs.; Mathematics, 4 hrs.; Teaching (25), 4 hrs.; Library Methods, 1 hr.

JUNIOR YEAR.

First term:	*hrs.*	*Second term:*	*hrs.*
*Shop 9 or 10	4	*Shop 11 or 12	4
Drawing 17 or 18	2	Drawing 19	2
Industrial History 5	4	Industrial Mathematics	4
Industrial Chemistry	4	Special Methods 27	2
*Electives	2	*Electives	4
	16		16

*Industrial Physics, 2 hrs.; Mathematics, 2 hrs.; Agriculture, 2 hrs.; Hammered Metal, 2 hrs.; Library Methods, 1 hr.

*Sheet Metal, 4 hrs.; Physics, 4 hrs.; Interior Decoration, 4 hrs.; Agriculture, 4 hrs.; Economics, 4 hrs.; Library Methods, 1 hr.

SENIOR YEAR.

First term:		*Second term:*	*hrs.*
*Shop 13 or 14	4	*Shop 15 or 16	4
Drawing 20 or 21	2	Drawing 20 or 21	2
History of Education 5	4	Supervision and Admin.	2
Industrial Physics 5	4	Sociology	4
*Electives	2	*Electives	4
	16		16

*Tool and Die Making, 2 hrs.; Physics, 2 hrs.; Art Smithing, 2 hrs.; Biology, 2 hrs.; Agriculture, 2 hrs.; Architectural Foundry, 2 hrs.; Library Methods, 1 hr.

*Teaching (26), 4 hrs.; Machine Construction, 4 hrs.; Gas Engine, 4 hrs.; Auto Motors, 4 hrs.; Library Methods, 1 hr.

A student majoring in Industrial Arts may elect either woodwork or metal work, or both, but should advise with the heads of the two departments before electing either.

Numbers before the following-named courses correspond to the outlined shop courses above.

Woodwork.	*Metal Work.*
1. Bench Work.	2. Forging.
3. Wood Turning.	4. Bench Metal and Elem. Mch.
5. Elementary Cabinetmaking.	6. Elementary Machine.
7. Pattern Making.	8. General Mch. Shop Practice.
9. Advanced Cabinetmaking.	10. General Mch. Shop Practice.
11. Adv. Carpentry and Mill Work.	12. Tool and Die Making.
13. Adv. Pat. Making and Foundry.	14. Foundry.
15. Survey of Industries.	16. Survey of Industries.

Model Training School Class.

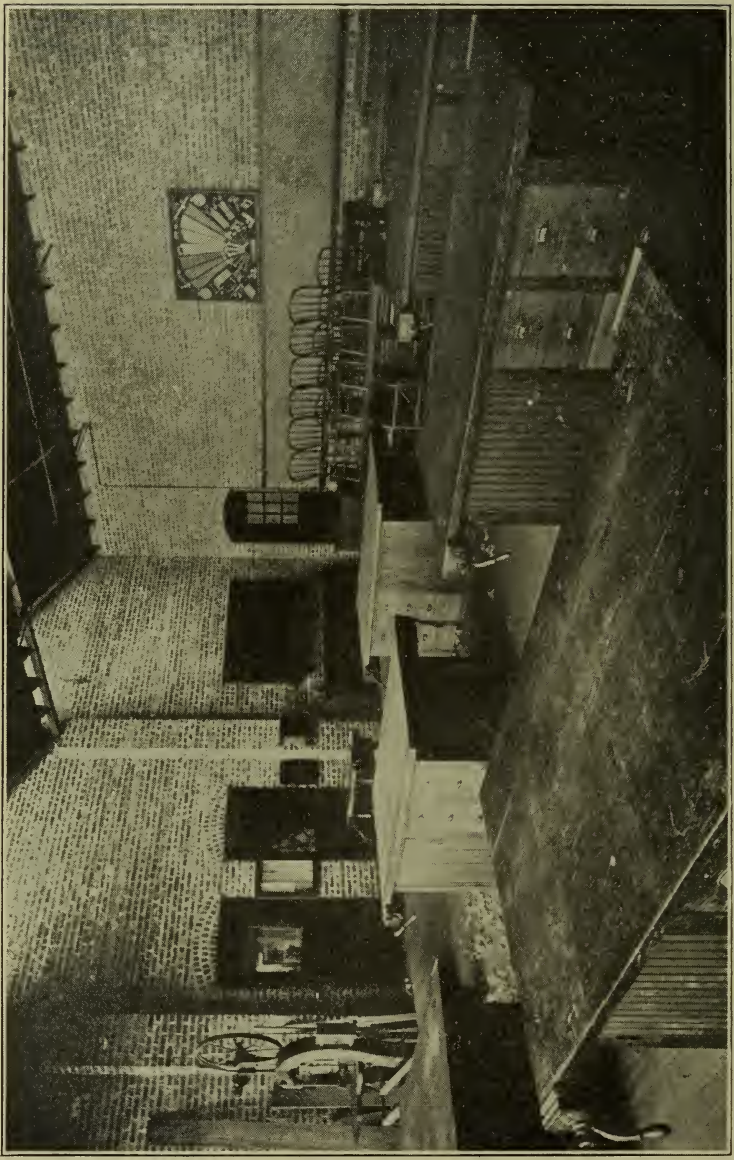
NORMAL COLLEGE.

WOODWORK.

The ideals and aims of the educational forces have changed rapidly in the last few years. New standards of service have been set which must be measured up to by the educational institutions. In conformity with these new ideals, we recognize that "Education is the process by means of which the individual acquires experience that will function in rendering more efficient his future action," and our citizenship demands that every individual shall acquire these experiences and be able to function them in his daily work. Consequently industrial training should become a large part of every school curriculum. Upon the normal schools must rest the burden of training teachers who can make this newer kind of education the vital and important part of every child's training.

For several years this School has been rendering very efficient service in preparing teachers for the industrial arts. It occupies a unique and an enviable position among the normal schools of the country. It is now taking another step in advance of all others, in that it is placing its shop work upon a factory basis and is pursuing modern economic shop methods. Instead of the usual plan of following a set course of models or projects, it is now the plan to build chiefly such articles as will easily and readily find a market, and just as soon as the student demonstrates his ability to work with a reasonable degree of proficiency and dispatch he is permitted to do work that will enable him to realize in a financial way. Modern methods of shop procedure, time cards, checking systems, etc., are used and the work made as practical as it is possible to make it.

"The successful men are they who have worked while their neighbors' minds were vacant or occupied with passing trivialities, who have been acting while others have been wrestling with indecision. They are the men who have tried to read all that has been written about their craft; who have learned from the masters and fellow-craftsmen of experience, and profited thereby; who have gone about with their eyes open, noting the good points of other men's work, and considered how they might do it better. Thus they have carried themselves above mediocrity, and in striving to do things the best they could, have educated themselves in the truest manner."



Benchwork Room, Showing Equipment and Overhead Lighting.

Course 1*a*.—BENCH WORK.

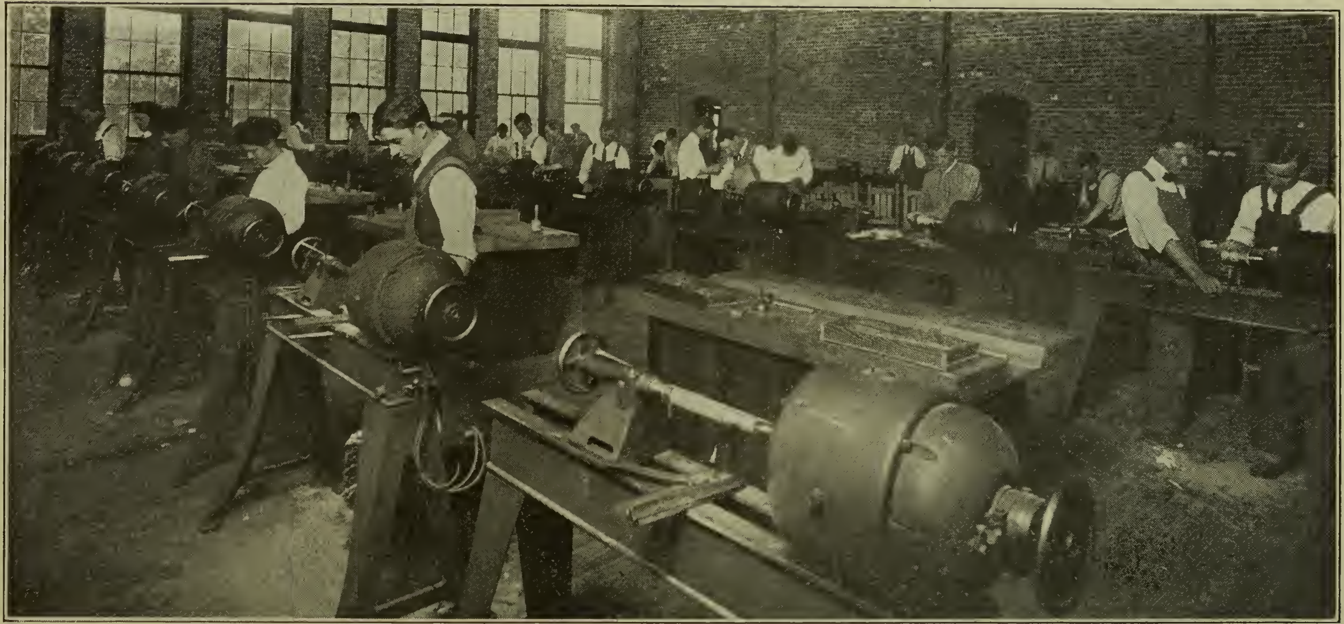
A beginning course which aims primarily to give a training in the technical processes as a basis for teaching in the sixth, seventh, eighth and ninth grades. It is not intended to develop mere manual dexterity, but to balance theory and practice. A portion of the time is given to demonstrations and lectures, discussions and reports on methods of teaching and courses of study. Students anticipate and solve some of the problems of teaching by preparing and presenting lessons or demonstrating tool processes as they would be given to a public-school class. Each student is encouraged to design original models which involve a definite order of related processes, and place them in an established course. Throughout the term, special outside reading is required on such subjects as tools and tool processes, principles of construction, fastenings—nails, screws, wedges, dowels, and glue—simple wood finishes, care of brushes, etc.

Students who have done one or more years' work in an accredited school should consult the head of the department concerning recognition of previous training. First term, first year. Five double periods per week for twenty weeks. Credit, four hours.

Course 1*b*.—BENCH WORK.

A course for those who have had one or more years' training in some accredited school and those who have had experience in the woodworking trades. This class of students possess some skill in the use of woodworking tools and may be expected to work with greater speed and accuracy, and therefore complete the required work in less time than those who have not had previous training and experience. This course is very similar to the preceding course, but not so much bench work is required. First term, first year. Five single periods per week for twenty weeks. Credit, two hours.

Wood Turning Projects.



A Class in Wood Turning.

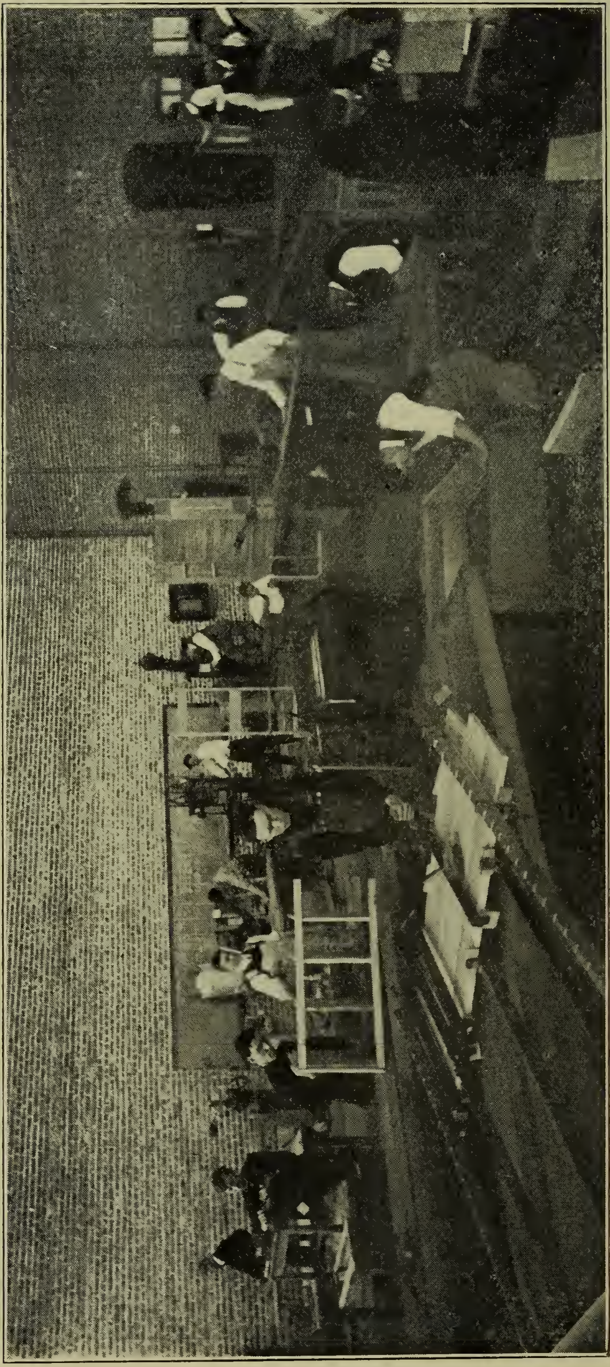
Course 3*a*.—WOOD TURNING.

Consists of instruction in the care of the lathe and tools, and in making a series of exercise pieces which give familiarity with the principles involved in roughing and turning cylinders, square ends, tapers, square corners, "V" cuts, beads and coves; and in faceplate, chuck and mandrel work. Correct grinding and honing of cutting tools is taught. Each piece of work introduces a new tool process, and a careful study is made of the relation between the tool and the revolving wood, so that a student understands the reason for handling a tool in a particular way for each cut. Each exercise will be followed by a practical application of the principle learned. First term, second year. Five double periods per week for twenty weeks. Credit, four hours.

Advanced Wood Turning.

Course 3*b*.—WOOD TURNING.

An abridged course for those who have had previous training or experience in the use of the lathe. Much of the purely exercise work is eliminated. Only enough of this preliminary work is demanded as will familiarize the student with the requirements of a good high-school course. The principal part of the work will deal with the more difficult faceplate, chuck and mandrel work, and with furniture repair work. First term, second year. Five single periods per week for twenty weeks. Credit, two hours.

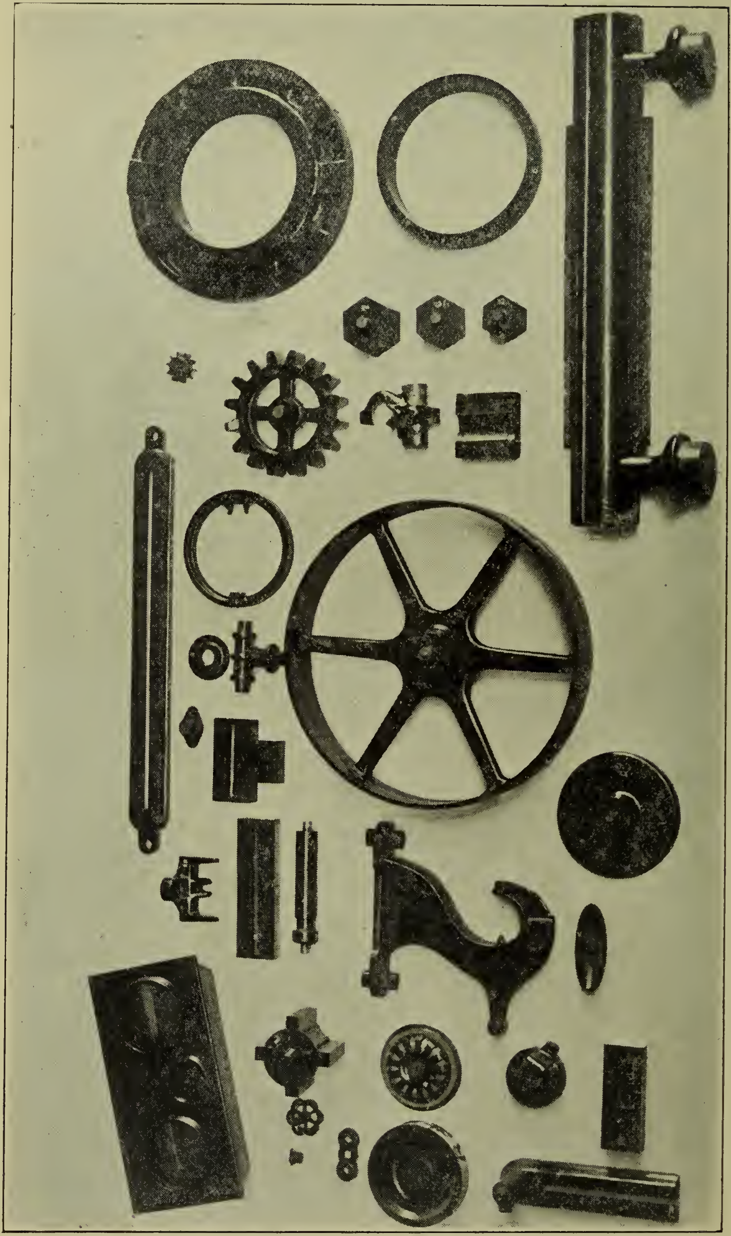


Class in Cabinetmaking.

Course 5.—CABINETMAKING.

An extension of course one, devoted largely to teaching the principle, use and care of the tools and machines with which the cabinetmaker works. The student learns to lay out work, and to make the various joints used in cabinet work; to set locks and hinges; and the use of finishing materials. Pieces of furniture are designed and drawn, mill bills worked out, and pieces prepared for hand work in the mill room. Economy of time, material, and energy is emphasized. Commercial methods are followed as nearly as possible. A carefully prepared notebook on the work done, covering fastening devices, materials, etc., is required. Outside reading is made a feature of the course. Second term, first year. Five double periods per week for twenty weeks. Credit, four hours.

Elementary Cabinetmaking.



Elementary Pattern Making.

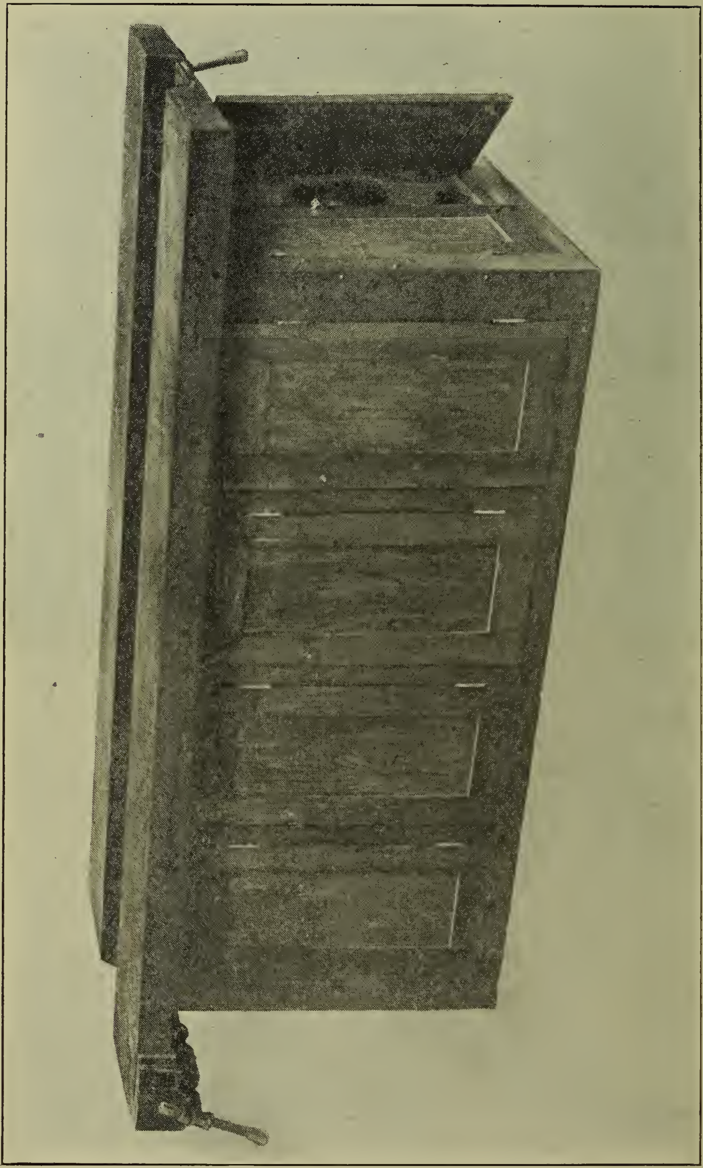
Course 7.—PATTERN MAKING.

Provides a thorough training in the reading of shop drawings, and their interpretation in the form of completed patterns. The student is taught the meaning and necessity of draft, the use of core prints, and making of core boxes; shrinkage of iron and other metals; its effect on different shapes and thicknesses of castings; how to join lumber to prevent warping and shrinkage of patterns; the use of segmental work; the meaning of such terms as fillet, boss, flange, rib, web, etc. Lectures and demonstrations will occur at frequent intervals. Finishing will receive its proper attention. All of the patterns made will be molded by the student making them, and any errors will thus be brought to the attention of the particular student. A study will be made of all the interests involved in the foundry of each pattern. Second term, second year. Five double periods per week for twenty weeks. Credit, four hours.

Elementary Wood Turning.

Course 9.—ADVANCED FURNITURE AND CABINETMAKING.

This course is essentially one in wood machine work, and the factory method of production is the main feature. Problems more difficult than those attempted in course three are worked out. The mill bill is made out, the various pieces cut in the most economical way by the use of power machinery; the mortises, tenons, relishes, grooves, etc., are laid out; the machinery is set up, and the various operations are done according to shop methods. Mill marks and other indentations are removed by the use of planes, scrappers and sandpaper. The various parts are assembled and finished. The use of the various machines makes the student familiar with wood-working machinery, its care and maintenance; grinding of cutters; adjusting and oiling of bearings; lacing and gluing belts, etc. In order that the student may observe methods and conditions that obtain in this industry, visits to factories are encouraged. First term, third year. Five double periods per week for twenty weeks. Credit, four hours.



Cabinet Bench Made by Students.

Course 11.—ADVANCED CARPENTRY AND MILL WORK.

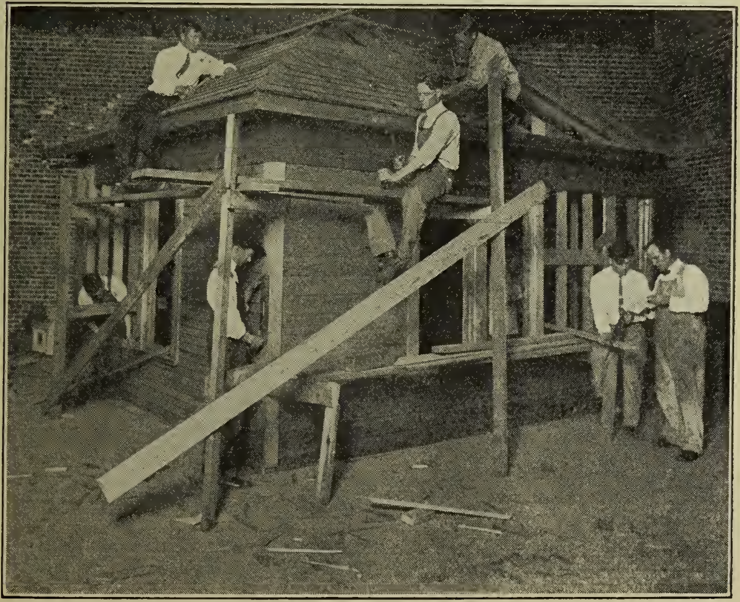
This course is planned to give the student a practical working knowledge of the various methods of house construction, and to acquaint the student with the care of woodworking machinery, the use of practical mill terms, setting up and running of machines.

The construction work consists of the actual construction of a house on a permanent site, or a section of a house in the shop, the students placing and leveling sills and floor joists, erecting walls, plumbing walls, cutting openings in studding and joists; laying out, cutting and placing common, hip and valley, and jack rafters; framing porch, etc. The square being used to frame all work, it is essential that every workman should have a thorough and practical knowledge of its capabilities and applications, and this course is to aid him in acquiring that knowledge.

Enough outside finish, such as cornice work, shingling, setting frames, siding, and porch finish, is given to acquaint the student with the best methods of commercial practice. Additional practice offered in cutting and placing jambs, fitting and hanging doors and sash, inside finish, fitting hardware, laying and scraping floors.

Especial emphasis placed upon stair work, laying out, cutting and placing rough stringers for steps; mode of laying out ordinary straight stairs; laying out winders; finishing with risers, treads and skirt boards; method of laying out and working hand-railing for quarter-turn and winding stairways.

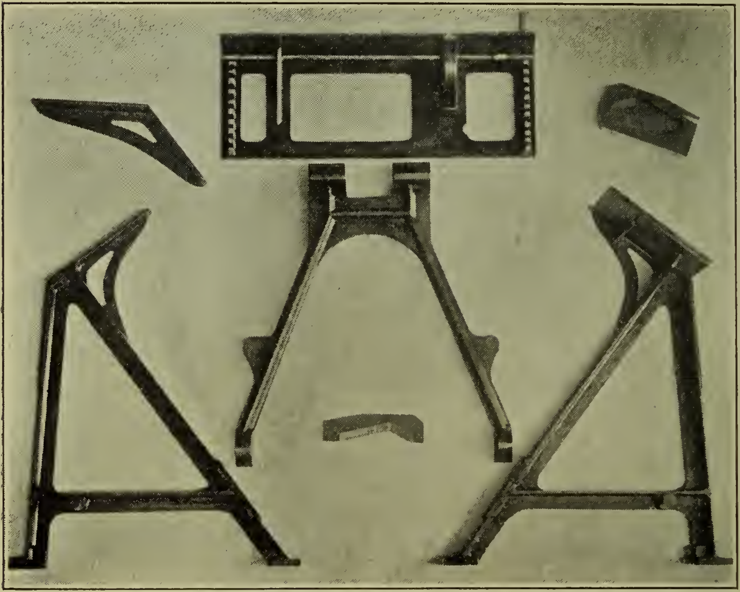
The mill work consists of lectures, demonstrations and practical work covering selection of machinery, approximate prices of machines, care of machinery, figuring shafting, pulley and cutter speeds, setting up and running. Second term, third year. Five double periods per week for twenty weeks. Credit, four hours.



House Construction.

Course 13.—ADVANCED PATTERN MAKING.

An advanced course emphasizing the construction of patterns for a complete machine, such as lathe, drill press, gas engine, electric motor, etc. First term, fourth year. Five double periods per week for twenty weeks. Credit, four hours.



Advanced Pattern Making.

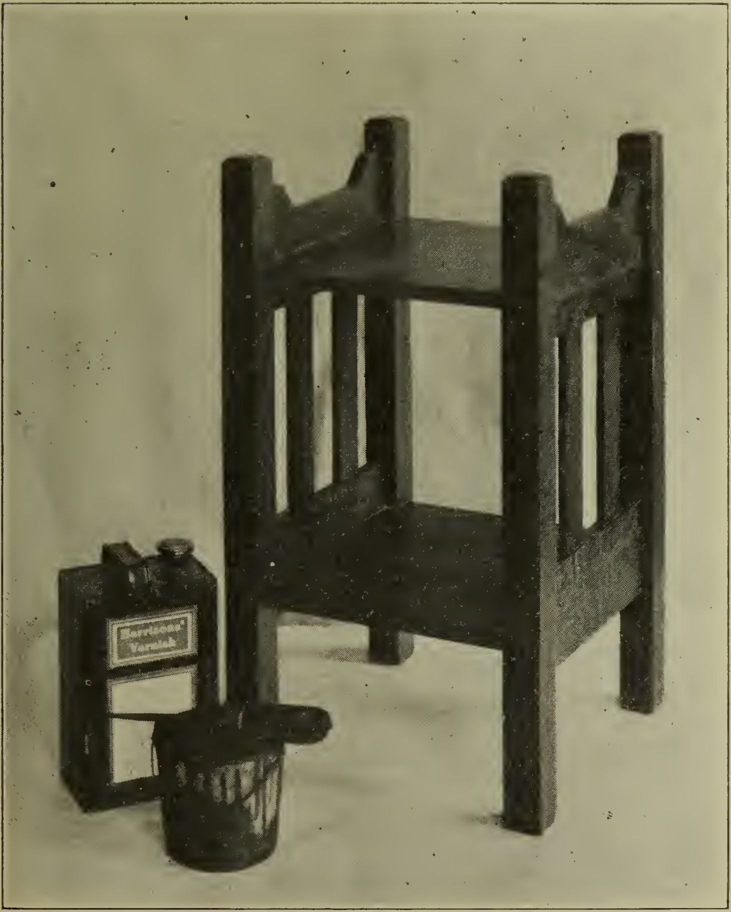
Course 15.—SURVEY OF INDUSTRIES.

Industrial education means industrial and social efficiency. Industrial education has, therefore, for its purpose the acquisition of a fund of knowledge that is capable of making its possessor an efficient future worker in the industrial world. It must acquaint the individual with the tools and materials used in industrial processes. It must give him a broad outlook upon industrial conditions. It must do its part to make him a useful, happy citizen.

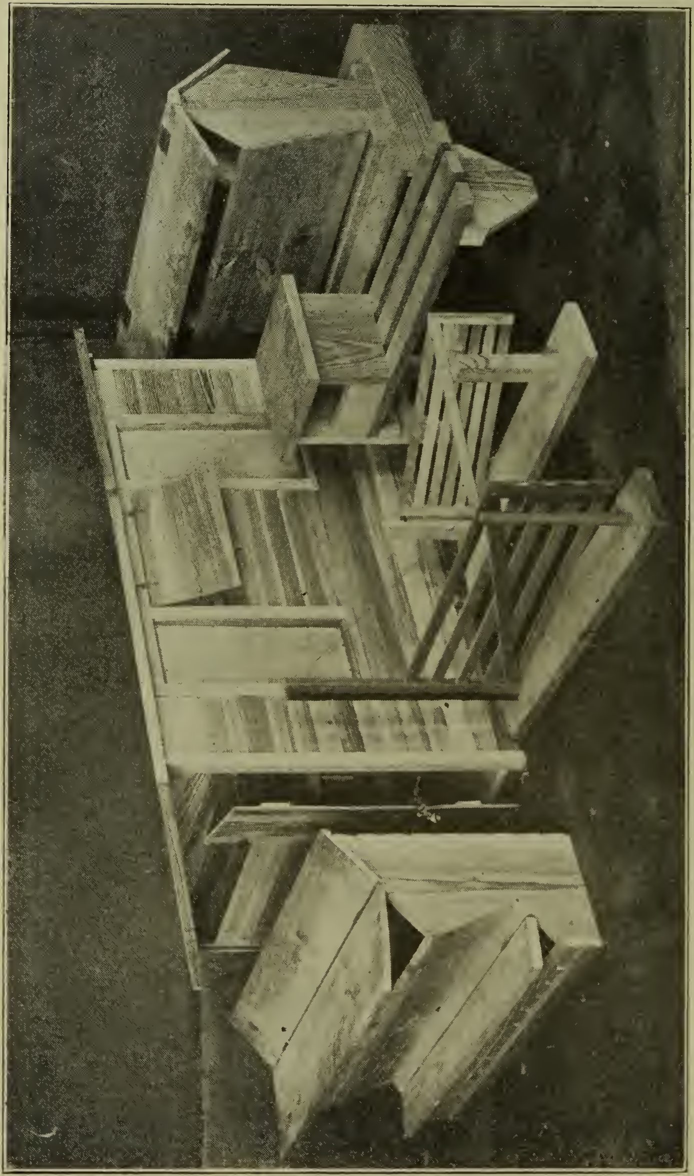
The time is at hand when more than mere ability to instruct in the use of tools is demanded of the manual training teacher. The man who possesses this broad understanding of the purpose of industrial training is the man who is now in demand as the director of the industrial work in our public school systems. This course makes this school a pioneer in this field of work by giving its students an opportunity and by aiding them in making a survey of the industries of this community and of the state, so that the teachers and directors of industrial work in this state may know how to become acquainted with the needs of the community in which they may be employed, that their work in the school may properly function in the world without. Second term, fourth year Four hours credit.

Course 17.—WOOD FINISHING.

Designed to familiarize the student with the various processes employed in wood finishing. A study and practice in the mixing and applying of finishing materials for interior woodwork and furniture. A collection of woods from which small panels are planed, scraped, sanded, stained, filled, and polished, showing the method and different kinds of finish. Some time will be given to practical work in painting, interior finishing, and the finishing and refinishing of furniture. Special attention given to conditions and methods for handling the work in manual training schools. Elective. Five double periods per week for twenty weeks. Credit, four hours.



Wood Finishing is One of Our Strong Courses.



Farm Building Construction.

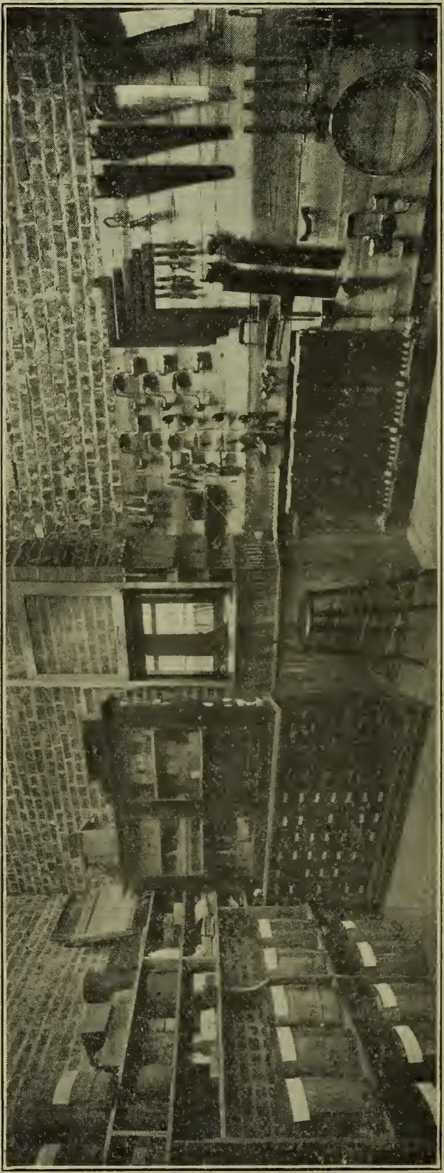
Course 19.—FARM BUILDING CONSTRUCTION.

The work of this course aims to give each student the fundamentals of building construction. There are, perhaps, two classes of teachers to be considered in formulating this course—those who may be required to teach carpentry restricted to house building in the town and city schools, and those who may desire a broader knowledge of the subject that will enable them to instruct in the rural communities where the demand is for a course in farm carpentry. Students specializing in agriculture will find work in this course very profitable. The work is largely individual, and encouragement is given to the greatest possible variety of projects. Elective. Five double periods per week for twenty weeks. Credit, four hours.

Model Poultry House.

Course 21.—CEMENT WORK.

A course designed to teach the fundamental principles involved in concrete construction by making a series of projects involving different ways of making and finishing concrete; to teach the proper use and care of the tools used in the work, and the methods of presenting the work to grade and high-school pupils. The course should appeal to those who expect to follow agricultural pursuits,



Tool Room.

and those who may teach in rural communities. The work consists of lectures on the importance of cement work; history and comparison of different cements; compositions of cement; proportioning; methods of measuring, and methods of mixing different proportions; tools and apparatus necessary for practical work, and the care of same; projects involving plain concrete construction, such as sidewalks, curbs, floors, walls, posts—fence, hitching, and clothes—and building blocks; reinforced concrete construction, such as columns, beams, steps, silos, cisterns, tanks, arches, culverts, driveways, and troughs. Elective. Two double periods per week for twenty weeks. Credit, two hours.

Course 23.—INDUSTRIAL EDUCATION.

Designed to familarize the student with the more professional aspect of the work of the teacher and supervisor of the industrial arts. The work consists of lectures, assigned readings, reports, etc. Among the various topics covered by the work are the following: Early educational history; Pestalozzi, effects of his work; education in Germany, France and England with reference to industrial education and manual training; work of Victor de la Vos and the Russian system of manual training; Cygnaeus, Salamon and the Sloyd movement; the beginning and development of manual training in the United States; aspect of the movement for the promotion of industrial education in the United States and abroad; legislation pertaining to industrial education; work of trade, vocational and technical schools studied and compared; sources of literature bearing on this phase of the public-school work. Second term, second year, two single periods per week for twenty weeks. Credit, two hours.

Course 25.—SPECIAL METHODS.

This course includes organization of courses of study in different media, and for different classes to meet given conditions; methods of presentation of subject matter; relation of manual training to other school courses; administration and supervision of a manual training department; planning equipment; cost of equipment and of maintenance of courses in elementary and secondary schools; specifications and orders written for equipment purchases. Second term, third year. Two single periods per week for twenty weeks. Credit, two hours.

Course 27.—SAW AND EDGE-TOOL SHARPENING.

Different kinds of saws and sharp-edged tools are studied in relation to the work that they are to perform, and ample practice is afforded to make application of the theory learned. A study is made of the proper angle for teeth of different types of saws. Blank blades are used on which to lay out the teeth, and then the waste is removed and the teeth jointed, set and sharpened. Much practice is required in fitting or putting into proper condition crosscut, rip, back, circular and band saws. Also brazing receives much attention. In the instruction for grinding and sharpening edge tools, means and ways for holding the larger knives, such as joiner and surfacer knives, receive attention, so that those who are not fortunate enough to have an aumotatic grinder may know how to do this important work. This is a very practical and serviceable course. Elective. Three single periods per week for twenty weeks. Credit, one hour.

EQUIPMENT FOR WOODWORKING.

In introducing manual training into a school system it is always difficult to determine how a given appropriation can best provide the most efficient equipment. There should be several determining elements in planning the manual-training course of study and the necessary equipment for carrying it on.

In order to answer frequent inquiries as to the cost of introducing manual training into a system of schools, the following lists are based on conditions of special appropriation rather than upon special educational aims. It is not the hope that these lists will be entirely satisfactory to all manual-training teachers. Some of the equipments specified are perhaps not the best possible, but they do represent very satisfactory selections for the money invested.

Minimum Equipment (Individual).

1 bench with wood vise, without drawer	$7.00
1 Bailey No. 4 smooth plane	1.60
1 12-inch back saw	1.00
1 No. 62 Stanley marking gauge	.15
1 No. 12 6-inch Stanley try-square	.20
1 ¼-inch Buck Bros. firmer chisel	.22
1 1-inch Buck Bros. firmer chisel	.36
1 No. 8 bench brush	.25
Total	$10.78

General Equipment.

1 Disston No. 7 crosscut saw, 10 points, 24-inch	$1.25
1 Disston No. 7 rip saw, 8 points, 24-inch	1.25
1 turning saw, 12-inch frame	.90
1 Barber plain brace, 8-inch sweep	.50
1 screw driver, 6-inch blade	.20
1 6-inch wing divider	.15
1 6-inch T bevel	.20
2 adz-eye claw hammers, No. 12	1.00
1 set Irwin auger bits	3.00
1 No. 41 Yankee automatic drill	1.00
3 ¾-inch gauges, outside ground	1.00
3 scrapers	.25
1 nail set	.10
4 10-inch hand screw clamps	1.25
2 wood-bar carpenter's clamps	1.80
1 spoke shave	.12
1 framing square	.75
1 mounted oilstone	.75
1 foot-power grindstone	5.00
Total	$20.47

Medium Equipment (Individual).

1 bench with wood vise	$12.00
1 jack plane, Bailey No. 5	1.75
1 block plane, Bailey No. 9½	.65
1 straight boxwood rule	.10
1 12-inch back saw	1.00
1 marking gauge, Stanley No. 62	.12

1	No. 1 round hickory mallet	.13
1	No. 12 6-inch Stanley try-square	.20
1	6-inch wing divider	.15
1	screw driver, 4-inch blade	.15
1	¼-inch Buck Bros. firmer chisel	.22
1	½-inch Buck Bros. firmer chisel	.27
1	1-inch Buck Bros. firmer chisel	.36
1	No. 2A bench brush	.30
	Total	$17.40

General Equipment.

3	Disston No. 7 crosscut saws, 10 points, 24-inch	$3.75
3	Disston No. 7 rip saws, 8 points, 24-inch	3.75
1	12-inch turning saw	.90
1	keyhole saw	.25
1	set Irwin auger bits	3.00
1	Miller's Falls hand drill No. 1	1.25
1	screw driver, 6-inch blade	.20
3	6-inch T bevels	.60
3	nail sets, assorted	.25
4	adz-eye claw hammers, No. 12	2.00
1	Barber ratchet brace, No. 322, 8-inch sweep	1.10
1	Barber ratchet brace, No. 323, 10-inch sweep	1.10
4	¾-inch gouges, outside ground	1.40
1	set No. 15 Buck Bros. carving tools	2.15
1	framing square	.75
4	hand wood scrapers	.35
6	10-inch hand wood clamps	1.85
6	8-inch hand wood clamps	1.50
4	wood-bar carpenter's clamps	3.50
1	mounted oilstone	.75
1	steel oiler	.10
3	spokeshaves No. 64	.45
1	mounted grindstone	9.00
	Total	$39.95

Complete Equipment (Individual).

1	bench, with rapid-acting vise	$20.00
1	Stanley Bed Rock jack plane No. 605	2.00
1	Stanley Bed Rock smooth plane No. 604	1.85
1	Stanley knuckle-joint block plane No. 18	.85
1	2-foot two-fold rule	.12
1	No. 8 12-inch Bishop back saw	1.00
1	No. 12 adz-eye claw hammer	.50
1	No. 1 round hickory mallet	.13
1	Stanley No. 71 marking gauge	.35
1	Stanley try-square, 6-inch blade	.20
1	Stanley No. 25, 6-inch T bevel	.20
1	6-inch wing divider	.15
1	screw driver, 6-inch blade	.30
1	¼-inch Buck Bros. firmer chisel	$0.22
1	½-inch Buck Bros. firmer chisel	.27
1	1-inch Buck Bros. firmer chisel	.36
1	No. 2A bench brush	.30
	Total	$28.80

General Equipment.

3	Bishop No. 90 crosscut saws, 8 points, 24-inch	$1.75
3	Bishop No. 90 crosscut saws, 11 points, 24-inch	1.75
2	Bishop No. 90 rip saws, 8 points, 24-inch	1.75
2	Bishop No. 90 rip saws, 6 points, 24-inch	1.75
1	set Irwin auger bits	3.00
1	Clark's expansive bit	.85
1	Miller's Falls hand drill No. 1	1.25
1	Yankeee No. 41 automatic hand drill	1.00
1	12-inch turning saw	.90
1	keyhole saw	.25
3	nail sets, assorted	.20
1	Langdon or Stanley miter box	9.00
1	drawknife, 8-inch blade	.65
2	framing squares	1.50
1	Stanley universal plane	12.00
6	1-inch gouges, outside ground	2.70
6	½-inch gouges, outside ground	2.00
1	set J. S. Addis carving tools	5.00
6	cabinet scrapers	.50
1	Bailey No. 8 jointer	3.00
6	12-inch hand screw clamps, steel spindles	4.80
6	10-inch hand screw clamps, steel spindles	4.50
6	6-inch hand screw clamps, steel spindle	3.60
4	carpenter's steel clamps, 48-inch	6.00
4	carpenter's wood-bar clamps, 5-foot	3.50
2	oilstones, mounted	1.50
1	steel oiler	.10
1	treadle grindstone	12.00
6	files, assorted	1.25
1	coping saw	.50
2	rose countersinks	.24
2	screw-driver bits	.30
4	Stanley spokeshaves No. 54	1.00
	Total	$90.09

Minimum Equipment for Wood Turning (Individual).

1	speed lathe, 8-inch swing, 20 inches between centers	$30.00
1	turning gouge, ½-inch	.40
1	turning gouge, 1-inch	.60
1	turning chisel, ⅜-inch	.40
1	turning chisel, 1-inch	.65
1	parting tool, 3/16-inch	.60
1	outside caliper, 6-inch	.60
1	dust brush	.30
	Total	$33.50

General Equipment.

1	oilstone, Washita	$0.75
1	slipstone, Washita	.20
1	oiler	.10
1	round-nose chisel, ⅝-inch	.50
1	spear-point chisel, ⅝-inch	.50
1	square chisel, ½-inch	.40
1	inside caliper, 6-inch	.75
1	grindstone	10.00
1	kerosene glue heater	1.50
	Total	$14.70

Medium Equipment for Wood Turning (Individual).

1	speed lathe, 10-inch swing, 30 inches between centers	$75.00
1	turning gouge, ¼-inch	.35
1	turning gouge, ½-inch	.40
1	turning gouge, 1-inch	.60
1	turning chisel, ¼-inch	.35
1	turning chised, ½-inch	.40
1	turning chisel, 1-inch	.60
1	parting tool, 3/16-inch	.60
1	outside caliper, 6-inch	.75
1	rule, 2-foot, two-fold	.20
1	dust brush	.30
	Total	$79.40

Complete Equipment for Wood Turning (Individual).

1	speed lathe, 12-inch swing, 36 inches between centers, individual motor drive	$125.00
1	turning gouge, ¼-inch	.35
1	turning gouge, ½-inch	.40
1	turning gouge, 1-inch	.60
1	turning gouge, 1¼-inch	.90
1	turning chisel, ¼-inch	.35
1	turning chised, ½-inch	.40
1	turning chisel, 1-inch	.60
1	turning chisel, 1¼-inch	.90
1	square chisel, ¼-inch	.35
1	square chisel, ½-inch	.40
1	round-nose chisel, ¼-inch	.35
1	round-nose chisel, ⅝-inch	.50
1	spear-point chisel, ⅝-inch	.50
1	parting tool, 3/16-inch	.60
1	outside caliper, 6-inch	.75
1	inside caliper, 6-inch	.75
	Total	$133.70

General Equipment.

6	oilstones, Washita	$3.50
6	slipstones, Washita	1.00
6	steel oilers	1.50
1	electric glue heater	25.00
1	combination power grinder	75.00
	Extra tools and faceplates	20.00
	Total	$126.00

In the event that power woodworking machinery is added, the following machines are perhaps most essential, in the order named:

1 30-inch band saw.
1 12-inch jointer, safety cylinder head, and guard.
1 24-inch single surfacer or planer.
1 universal or combination table saw.
1 mortiser.
1 tenoner.
1 belt sander.
1 wood trimmer.

NORMAL HIGH SCHOOL COURSE.

Year	Term	CONSTANTS.	COURSE REQUIREMENTS.						ELECTIVES.
		Required in All Courses.	1 Manual.	2 Household Arts.	3 Agricultural.	4 General.	5 Language.	6 Professional.	Each term subjects offered in other courses than the one taken.
1	1	English I. Algebra I. Biology I.	Bench Woodwork. Drawing I.	Domestic Art I. Drawing II.	Physical Geography. Agricultural Botany.	Physical Geography I.	Latin, *or* German.	Elective.	
	2	English II. Algebra II. Biology II.	Joinery. Drawing III.	Domestic Art II. Drawing IV.	Physical Geography. Elementary Zoology.	Physical Geography II.	Latin, *or* German.	Elective.	
2	1	English III. *Geometry I.	Wood Turning. Drawing VII. Elective.	Domestic Art III. Drawing V. Elective.	Agronomy. History I.	History I. Elective.	Latin, *or* German. Elective.	Music ½ unit. Arithmetic ½ unit.	
	2	English IV. *Geometry II.	Cabinet Work. Drawing VI. Elective.	Domestic Art IV. Drawing VI. Elective.	Soils. Horticulture. History II.	History II. Elective.	Latin, *or* German. Elective.	Drawing ¼ unit. Penmanship ¼ unit. Elective.	
3	1	*English V. Physical Science I. Physical Training.	Pattern Making, *or* Forging. Drawing VIII. Elective.	Domestic Science I. Elective.	Animal Husbandry. Elective.	Arithmetic I. Elective.	Latin, *or* German. Elective.	Reading ½ unit. Geography ½ unit.	History III. Biology.
	2	*English VI. Physical Science II. Physical Training.	Pattern Making, *or* Bench Metal. Drawing IX. Elective.	Domestic Science II. Elective.	Farm Dairying. Elective.	Algebra III. Elective.	Latin, *or* German. Elective.	History ½ unit. Word Analysis ½ unit.	History IV. Biology.
4	1	History V. Physical Training.	Building Constr., *or* Elem. Machine. Drawing IX *or* X. Two Electives.	Domestic Science III. Two Electives.	Chemistry. Rural Economics. Elective.	English VII. Two Electives.	Drawing. Latin. Elective.	Physiology ½ unit. Psychology ½ unit. Elective.	Psychology. Physical Science. Biology. Solid Geometry.
	2	History VI *and* History VII. Physical Training.	Cement Work *and* Saw Filing, *or* Elem. Machine. Two Electives.	Domestic Science IV. Two Electives.	Chemistry. Farm Management. Elective.	Music. English VIII. Elective.	Music. Elective. Latin.	Management ½ unit. Special Methods ½ unit. Elective.	Management. Teaching. Physical Science. Biology. Trigonometry, *or* Shop Mathematics.

*Not required in professional course.

NORMAL HIGH SCHOOL.

WOODWORK.

Course 1.—BENCH WORK.

Includes a study of tools—as uses, names of parts, adjustments, their care, and how to sharpen; the making of a few important joints used in wood construction and their application in making useful projects; a study of materials, fastenings, etc.; notebook work, covering the talks, demonstrations, problems, sketches.

Five double periods per week for twenty weeks. Credit, one-half unit.

Course 3.—JOINERY.

This course includes a study of new tools, as uses, names of parts, adjustments, care of, and how to sharpen; the making of important new joints and their application in the making of useful projects; a study of the different woods and materials used; demonstrations, and notebook work.

Five double periods per week for twenty weeks. Credit, one-half unit.

Course 3.—WOOD TURNING.

Includes the care and use of turning tools, care and adjustments of lathe, turning between centers, chuck, faceplate and screw-center work, polishing in the lathe. Exercise work followed by applications in some useful project.

Five double periods per week for twenty weeks. Credit, one-half unit.

Course 5.—CABINET MAKING.

Includes the use of general woodworking tools and machines; designing and constructing of furniture and cases for home and school use; a study of woods; and a carefully prepared notebook on the work done, covering fastening devices, materials, demonstrations, etc.

Five double periods per week for twenty weeks. Credit, one-half unit.

Course 9.—PATTERN MAKING AND MOLDING.

Includes instruction in the use and care of tools and machinery; instruction in allowances for draft, shrinkage, finish, shake and warp; a study of all the interests involved in the foundry of each pattern; and the making of patterns involving the fundamental principles of the trade.

Five double periods per week for forty weeks. Credit, one unit.

Course 13.—WOOD FINISHING.

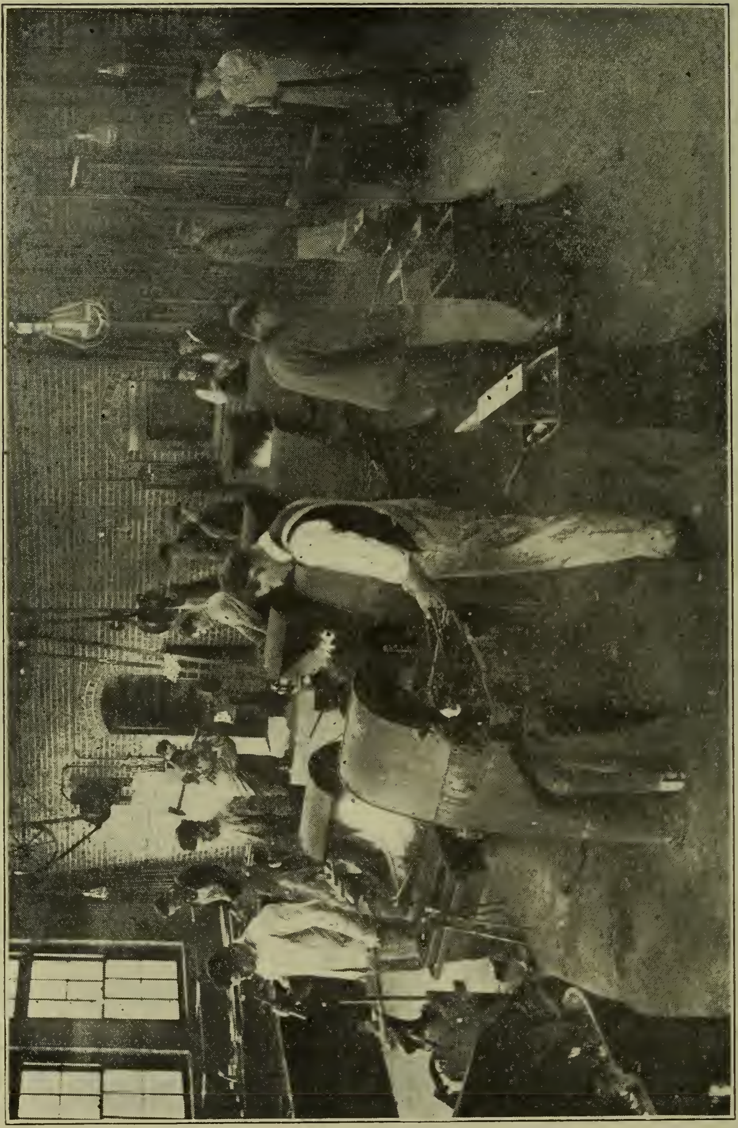
Designed to familiarize the student with the various processes employed in wood finishing. Practice in the mixing and applying of finishing materials. Special attention given to the finishing of new and refinishing of old furniture.

Five double periods per week for twenty weeks. Credit, one-half unit.

Course 17.—SAW AND TOOL SHARPENING.

Practice in jointing, setting and filing of various kinds of saws as cross cut, rip, circular and band saws. Grinding and sharpening of edge tools as machine knives, scythes, sickles, etc., receive attention. A very practical course.

Three double periods per week for twenty weeks. Credit, one-fourth unit.



Forging. Course 2.

METAL WORK.

Although not so extensively used in this section of the country as wood work, it is rapidly coming to the fore, and it will be but a short time when all schools will adopt this course in their manual-training work.

As taught in this School, it gives the student the theoretical as well as the practical side of the work. It not only shows how the work is done, but why it is done. All work is done from drawings, and must be done accordingly before credit can be given.

The student receives some very practical work in making all new and repair parts about the institution.

Metal work is divided into three distinct subjects as follows:

Forging,
Machine Shop Work,
Foundry Practice.

These three subjects are subdivided into the different courses as taken up.

Forging is divided into two classes: (*a*) Elementary forging; (*b*) general forging.

Machine-shop work is divided as follows: (*a*) Bench metal work; (*b*) elementary machine work; (*c*) general machine-shop practice; (*d*) tool and die making.

Foundry: (*a*) Bench work; (*b*) floor work.

The equipment in this department is surpassed by none in this section of the country, either in schools or commercial shops, all shops being well lighted and ventilated.

The forge shop equipment is:

12 Buffalo overhead-draft hand forges and anvils.
9 Sturtevant down-draft power forges and anvils.
1 hand drill press.
1 power hammer.
1 emery grinder.
Bench and blacksmith vises, and small tools necessary to make the shop complete.

The machine shop consists of:

6 work benches.
12 4-inch packer's vises.
1 24-inch LeBlond engine lathe and equipment.
1 16-inch LeBlond lathe and equipment.
1 15-inch LeBlond lathe and equipment.
3 14-inch Sebastian lathes and equipment.
1 12-inch Seneca Falls lathe and equipment, with gear-cutting attachment.
1 15-inch Shellenbach lathe and equipment.
1 12-inch Hendee lathe and equipment.
1 No. 1½ milling machine and equipment.
1 Cincinnati grinder and equipment.
1 safety net grinder and equipment.
1 26-inch Gray planer and equipment.
1 16-inch Steptoe shaper and equipment.

Bench Metal Course 4.

1 Stanley sensitive drill and equipment.
1 Kern drill press and equipment.
1 Stewart combination furnace.
1 electric emery grinder.
1 Swain punch.
1 bench lathe.
1 12-inch Marvel power hack saw.
1 10-inch Bun circular saw.

A fully equipped tool room, consisting of drills, taps, reamers, cutters, etc., necessary to make shop complete. The tool room is run on a check system and is in charge of a student who is responsible for the same.

Foundry is equipped with a No. 1 Whiting 22-inch cupola, one Obermayer core oven, and benches and hand tools necessary to make the foundry complete and for bench and floor work.

Metal-working Courses Explained.

Course 2.—FORGING.

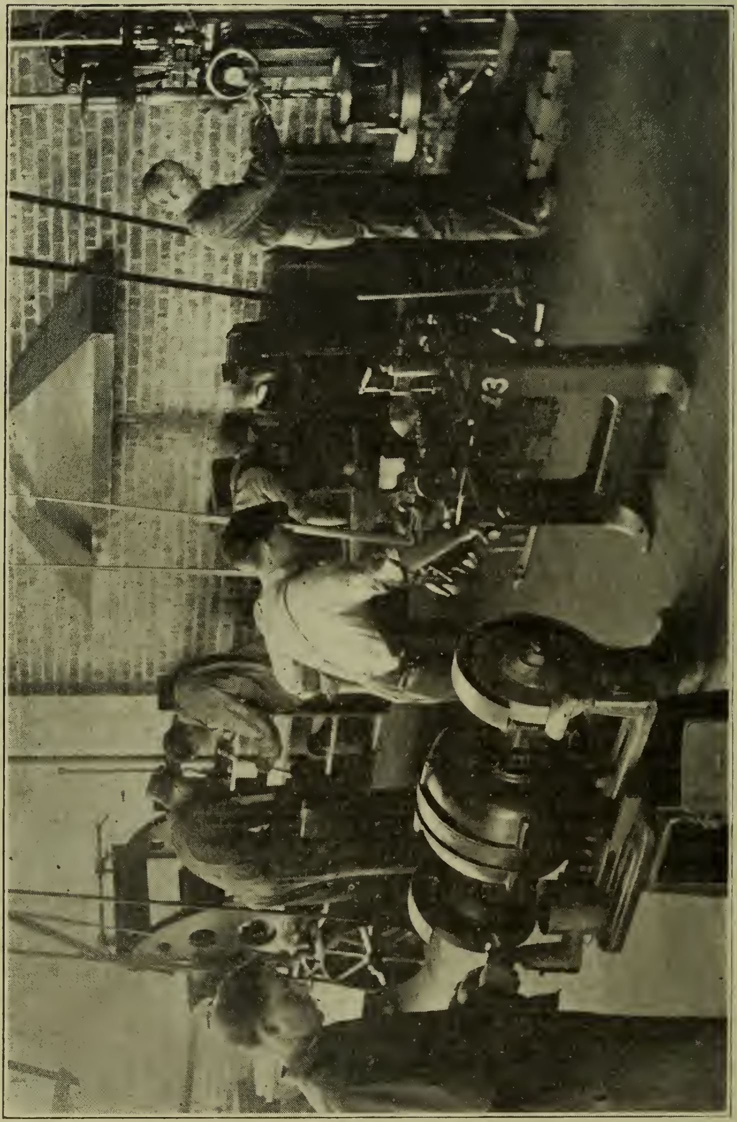
The theoretical as well as the practical side is taken up in this course. Forging may be classed as the introduction into metal work, and this course must be completed before we can expect to do satisfactory work in the other metal-working departments. This work takes in the construction of different kinds of forges; the fire and its parts; fuel; proper use of tools; the heats for the working of different materials; drawing out, bending, swaging, upsetting, twisting; several kinds of welds; uses of flux, and kinds; punching; the making of chisels, hammers, blacksmiths' tools, lathe, planer, shaper, plumbers' and bricklayers' tools; use of power hammer; the annealing, hardening and tempering of tools for different metals; casehardening and coloring. Outside reading is required in this course. Ten hours in shop, two hours outside. Four hours credit.

Courses 4-6.—BENCH AND ELEMENTARY MACHINE-SHOP PRACTICE.

This course is planned to give the student the correct idea as to the use of hand and small machine tools, the theoretical and practical work for the beginner. It consists of a series of exercises on the bench, such as chipping, filing to fit, laying out, centering, and machine drilling, scraping to a surface, tapping and threading with hand dies. From bench work the student receives a good insight as to the work done on the machine. Elementary work on the machine consists of taking of notes relative to the working speeds and feeds of machine on different metals, also the grinding of drills and tools for several metals to get the best results from these grindings. The practical part of this course is the use of all lathes, planers, shapers, drill presses, saws, and plain milling-machine work. In lathe work we do straight cylindrical taper turning, and boring, shouldering, parting, chuck work; the cutting of single, V and U. S. standard threads; hand turning and knurling. Planer and shaper work consists of straight, angle and oval cutting, key-seating and slotting. In milling work we do plain end, face and straddle milling, slotting, sawing and key-seating. Prerequisite, course 2. Ten hours in shop, two hours outside. Four hours credit.

Courses 8-10.—GENERAL MACHINE-SHOP PRACTICE.

This course is a continuation of course 4, designed for the student's use in machine construction, millwrighting, and general repair work. Machine construction is the making of small machinery, instruments and tools, the cutting of multiple threads on the lathe;



Elementary Machine Practice. Course 6.

also square, worm and acme threads; the use of the universal milling and grinding machines, such as using the dividing head, plain and differential indexing, vertical milling and slotting; making spur, spiral, bevel and worm gears, and plain and cylindrical grinding on the grinder. Prerequisite, courses 2-4. Ten hours in shop, two hours outside. Four hours credit.

Course 12.—TOOL AND DIE MAKING.

Tool and die making are more advanced work in shop practice. In this course mathematics plays an important part. The practical part consists of the making, annealing, hardening, tempering of all milling-machine tools or cutters, and of the hand tools, such as mandrels, taps, dies, reamers, drills, and all necessary small tools. Internal grinding is also given, and the making of jigs. Die making consists of the making, annealing, tempering, etc., of dies and punches for practical use on our punch press. Prerequisite, courses 2, 4-6. Ten hours shop, two hours outside. Four hours credit.

Course 14.—FOUNDRY.

Manual-training schools that give a course in pattern making should introduce foundry work. Pattern making can not be properly taught unless some facilities are available for demonstrating molding methods. Without this the beginner finds it very hard to understand the methods and constructions of patterns.

Outline of Foundry Course.

(1) Lectures are given on the following: Foundry terms, tools and flashes, moldin sand, green sand, molding, facing, core sand and mixtures, binders and cores, metals and pressure in molds, core ovens, fluxes and their uses, brass furnames.

(2) Demonstrations of Molding. Green and dry-sand molding and loam work, ramming, venting, parting, gating, and other practical processes.

(3) Molding Practice. Cutting and tempering of sand; two- and three-part and check flask work, bedding in, sweeping work and open-sand molding.

(4) Core Making. Mixing core sand, making, baking and setting cores.

(5) Use of Brass Furnace. Firing, melting, mixing, skimming, and pouring nonferrous metals.

(6) Cupola Practice. Lining, making bottom and breast, drying, firing, charging, mixing metals and melting, pouring, skimming and chipping castings.

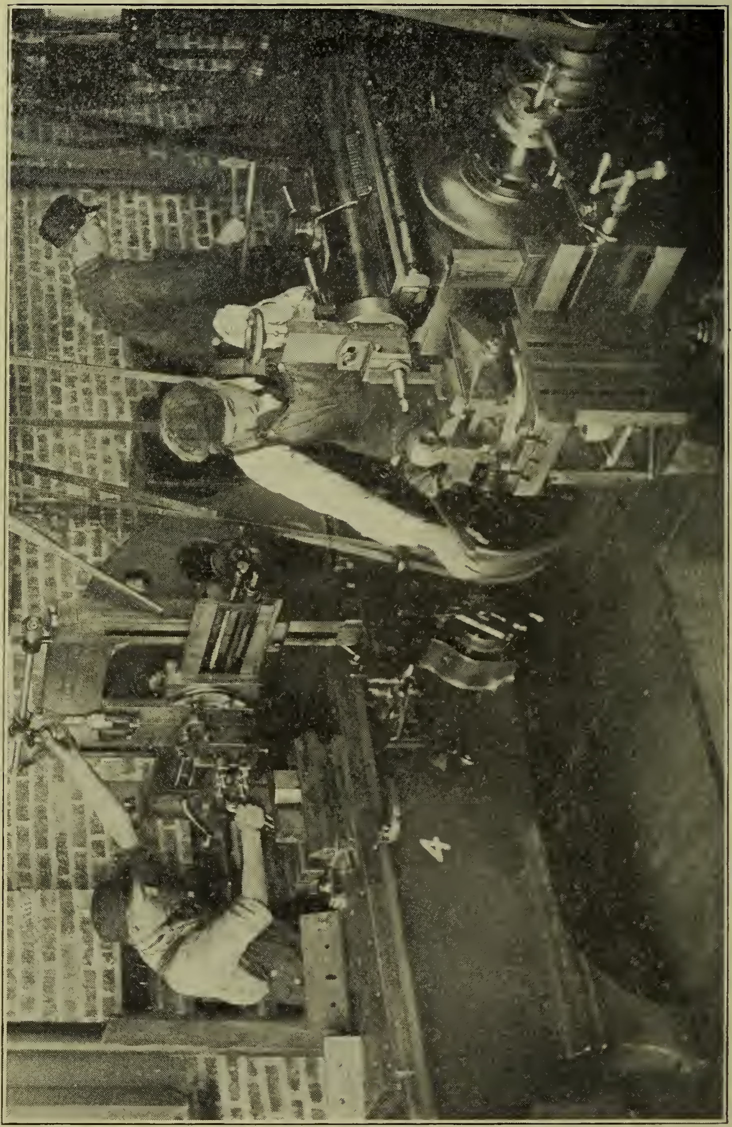
Ten hours in shop. Two hours outside. Four hours credit.

Course 16.—SURVEY OF INDUSTRIES.

A survey of some town or city will be made to ascertain what kinds of work should be taught in that community, also the wages paid to employees, living conditions, opportunities for advancement, sanitary conditions or objectionable features of industries, duration of industries in that community, etc. Four hours credit.

Course 18.—FARM MECHANICS.

In this age of farming, the thing to be considered is economy of time and efficiency, and this course is especially designed to help the farm community in the care and repair of farm machinery. It includes the making, tempering, etc., of chisels, picks, bolts, hooks, clevises, swivels, chains, punches, hammers, the sharpening of plowshares, cultivator teeth, etc. Special lectures are given in this course on the care of the horse's feet and legs. The care and re-



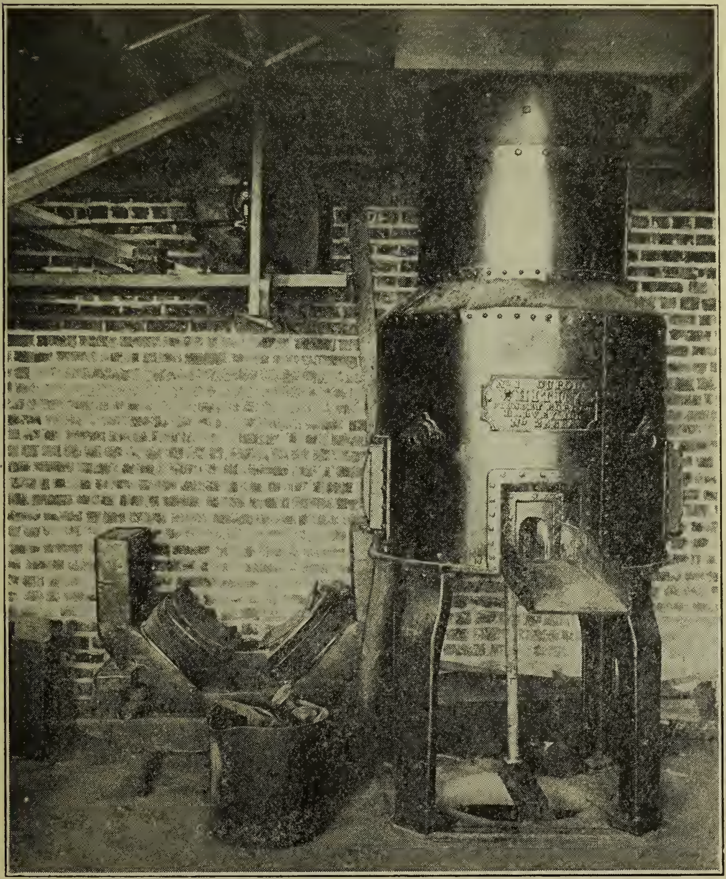
General Machine Shop Work. Courses 8 and 10.

pair of gas and gasoline engines are also included. Prerequisite, courses 2-4. Ten hours shop, two hours outside. Four hours credit.

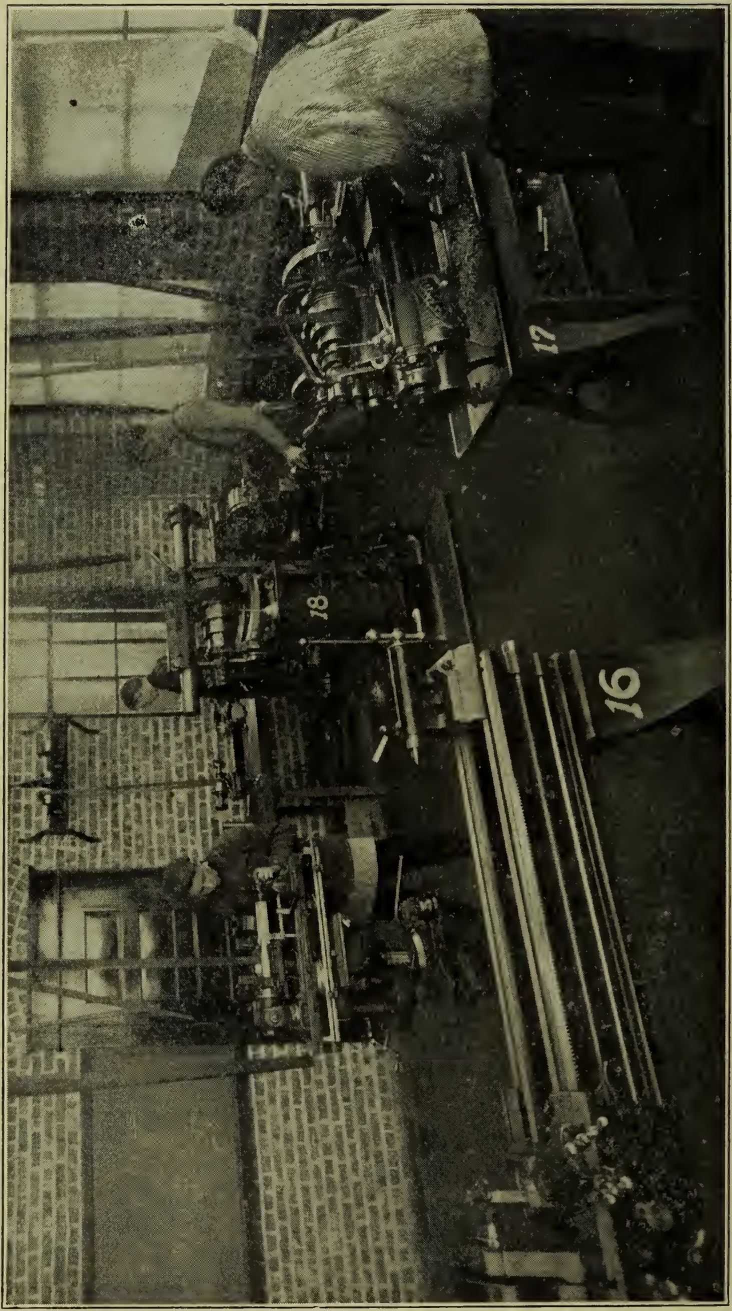
Course 20.—SHEET AND HAMMERED METAL.

Sheet-metal work consists of laying out, forming, riveting, soldering and brazing, as used in such work, pertaining to the making of boxes, cylinders, cornice and ell work in tin, zinc or copper. Prerequisite, course 14, Drawing Department. Five hours in shop, two hours outside. Two hours credit.

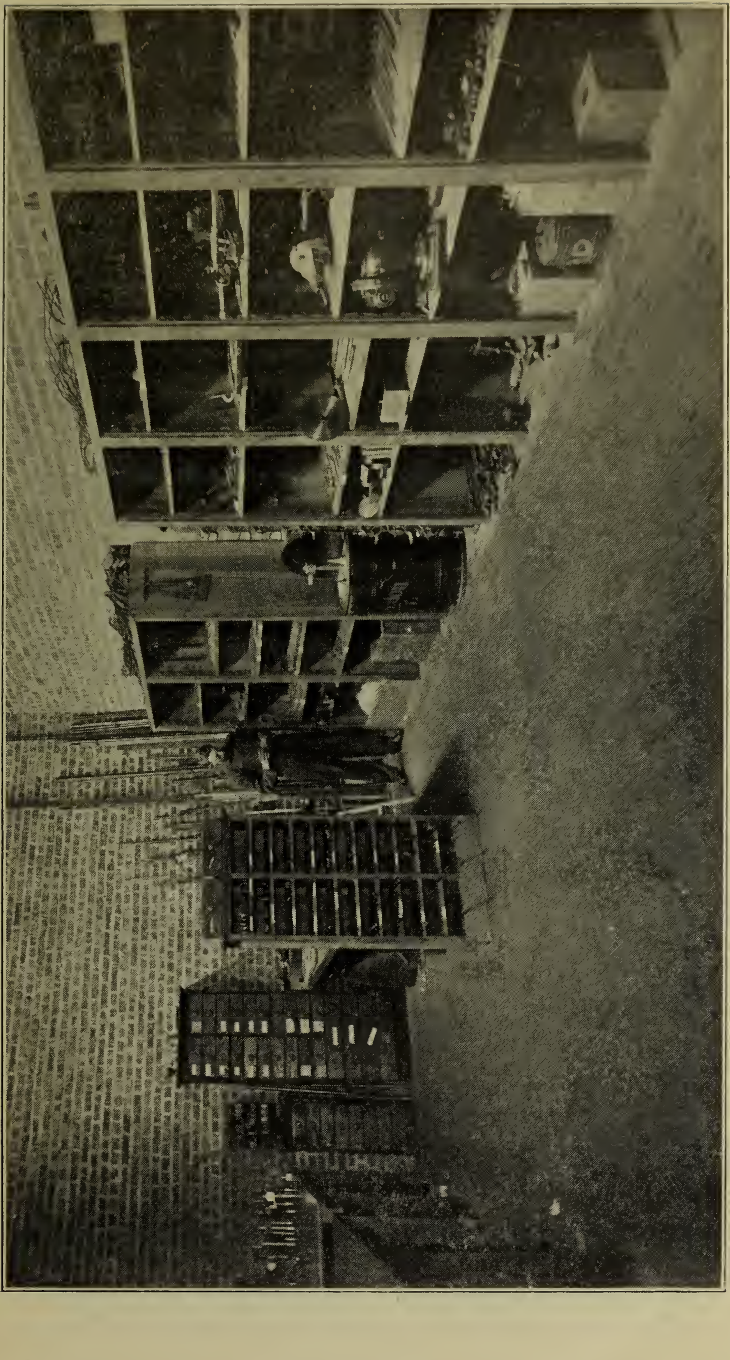
Hammered metal is designed for the use of the teacher in art and design. It consists of the making of bowls, trays, inkstands; jewelry work in copper, brass and silver; the lacquering and etching of metals. All designs of this work are made in the Design Department. Prerequisite, course 13, Drawing Department. Five hours in shop, two hours outside. Two hours credit.



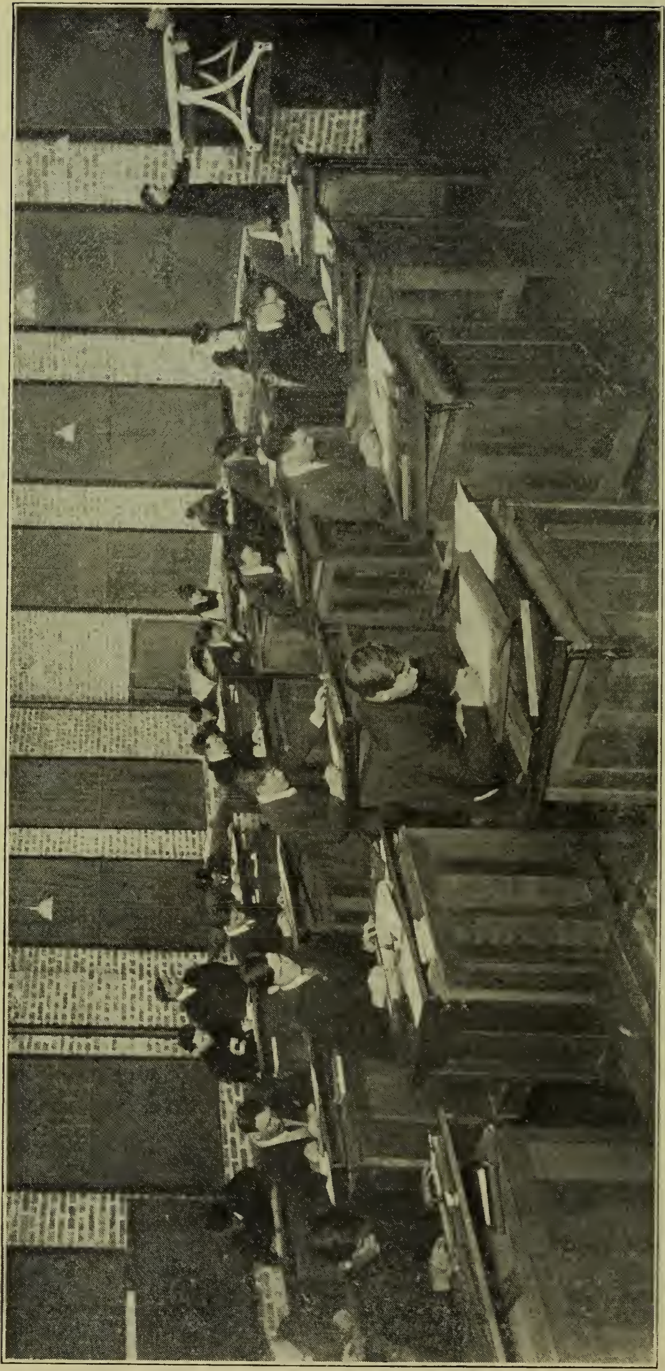
Foundry.



Tool and Die Making.



Tool Room.



Mechanical Drawing.

MECHANICAL DRAWING.

The course in mechanical drawing aims to cover the fundamental principles of constructive drafting, to cultivate the essentials of good workmanship—namely, accuracy, thoroughness, and neatness. Like other branches of applied mathematics, it strengthens the inventive and constructive ability of the student; at the same time it tends to develop a love for systematic, precise and neat work. On the industrial field a knowledge of mechanical drawing is indispensable. All constructive work is first planned in a drawing. The old cut-and-try method is both too costly and too slow. In the United States Patent Office models are no longer required, but complete mechanical drawings may be used instead, thus saving a vast amount of time and space. The great feats of to-day in engineering would be impossible without the knowledge and use of constructive drawing.

Problems in machine and bridge design are now done graphically. There is no man who takes any part in the world's activities of to-day but frequently meets some problem in the industrial field. The blue print is to the mechanic what the printed page is to the lawyer, doctor or merchant; and a knowledge of drafting is just as essential to him.

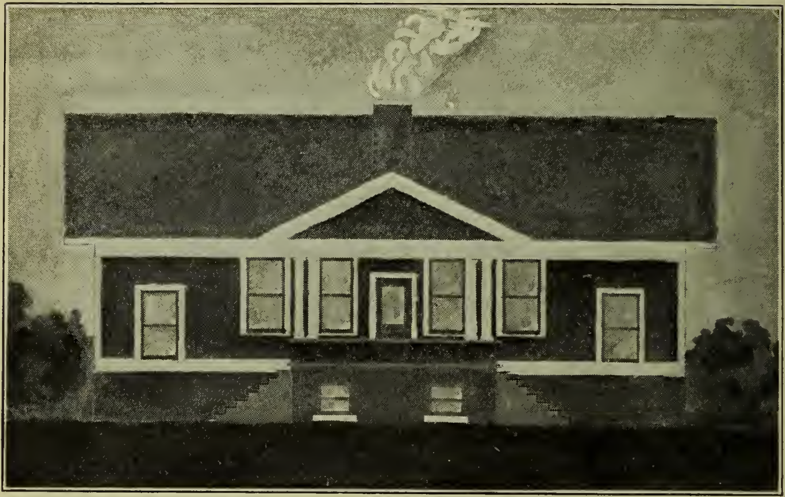
The course in mechanical drawing gives the student such knowledge as he would need in order to teach the subject in our high schools, and further gives him a foundation for machine design and architectural drafting, if he cares to pursue his drawing work further.

A large file of tracings of projects in cabinet work, wood turning, pattern making, forge and machine shop are on hand. Blue prints are made of these at small cost, and the student gets a thorough knowledge of blue printing as well as a large number of shop projects of his own.

The drafting for all shop problems constructed by the student is first worked out by him in the drafting room, from shop sketches or the object itself, many of which are of his own designing. The student thus becomes the inventor, designer and maker of his own projects.

The work in machine design takes up some particular type of machine used in the shop. From these drawings are made. A file of floor plans for machine shops, forge rooms, woodworking rooms, drawing rooms, print shops, etc., for high schools, are being collected, so that each student may become familiar with such problems as he likely will be called upon, as a teacher, to perform.

The world gives its admiration not to those who do what nobody else attempts, but to those who do best what multitudes do well.—*Macaulay.*



ARCHITECTURAL DRAWING.

The course in architectural drawing will always be one of the important studies in drafting, because architecture is so closely related to life. Every one expects to build a home, and the greatest difficulty with which home builders have to contend is that, when filled with the enthusiasm and the desire to see their vision realized, they have plunged in the task without any preparation in planning arrangements, conveniences, or a knowledge of costs of materials, and the laws governing building and sanitation. Consequently, many changes are found necessary as the building progresses, and the final cost will often be far in excess of the first estimate, for the contractor or carpenter must base his estimate upon the actual cost of materials and workmanship plus his profit, and any change in the plan means a change in the materials used. Tearing down and rebuilding of work means waste of material and added expense for extra time put in by the workmen.

Architecture is considered by all competent authorities as a fine art, for it is closely related to the best life as well as the vital life of the people, and especially is this true in the building of a home. Drawing and design are essential things in the education of the architectural draftsman, for he must have a broad understanding of the principles of harmony and color as related to construction and surface decoration, as well as the relation and interrelation of the parts of a dwelling-house, if he is to think and reason correctly in the various problems which he will meet.

The aim of this course is to develop a thorough understanding of practical and esthetic principles which will be of practical value to the student, whether he be a teacher of the subject in high schools and vocational schools, or as a draftsman. The work is planned to give a knowledge of methods and materials as they are found in actual building operations, and it is varied in character to meet the demand for form, proportion, and to teach the value of decoration, as well as to give the ability to lay out scale drawings of structural details for actual building operations.

After preliminary work in drafting conventions, drawing of moldings, the student will make sketches of house plans on cross-section paper at the scale of one-sixteenth inch to get the most effective arrangement of rooms. The plan is then drawn to one-eighth-inch scale, making the rooms to size and shape, making the openings, chimneys, location of the various pieces of furniture, stairways, etc., giving particular attention to convenience, ventilation, heating, lighting and vistas, both inside and out, for the house must be studied with reference to its location and environment.

The plan will then be drawn to the regulation one-fourth-inch scale, where all measurements will be determined to exact size, with constant reference to dimension lumber. The drawings are made to meet the demands of the best office practice. The elevations of the house will be made, giving due consideration to the arrangement of the architectural detail in making an attractive appearance.

Drawings of typical framing and constructional details, interior and exterior, of stairs, porches, columns, etc., are made at three-fourths-inch and full-size scale.

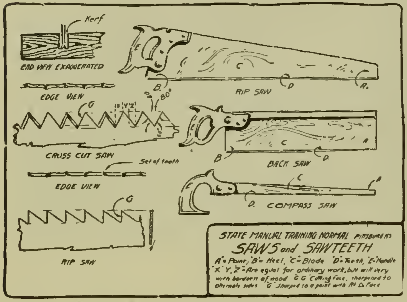
After a full set of drawings has been completed the student will make a study of the plan with reference to the cost, specifications with the laws governing building and sanitation, water supply, sewers, heating, lighting and ventilation.

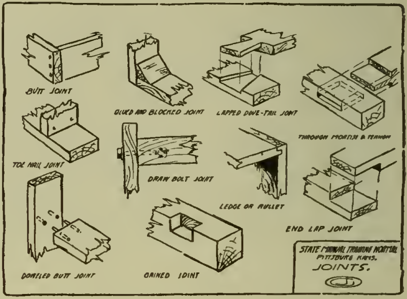
ORDER AND BEAUTY.—Make no little plans; they have no magic to stir men's blood and probably themselves will not be realized. Make big plans; aim high in hope and work, remembering that a noble, logical diagram once recorded will never die, but long after we are gone will be a living thing, asserting itself with evergrowing insistency. Remember that our sons and grandsons are going to do things that will stagger us. Let your watchword be order and your beacon beauty.—*Daniel Burnham.*

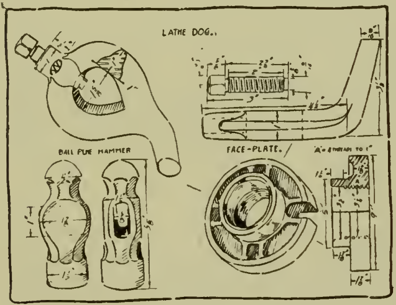
SHOP SKETCHING.

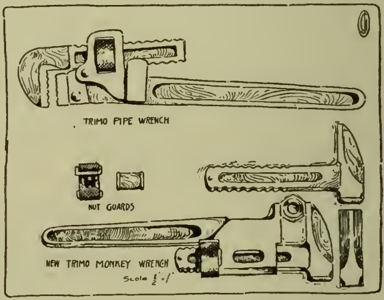
Shop sketching is the free-hand representation of an object in its true size, shape and proportions, as it is seen by the draftsman, or of an idea he has formed in his mind, or it may be used to make the idea clear to another.

Through pencil drawing the pupil develops the power of visualization in forming a clear mental picture of an object in his mind. Before he attempts to construct the finished product he must be able to see the size, shape and proportion of each separate part, as well as the finished product ready for use. It is impossible for one to obtain this power of vision through mechanical drawing alone. Any one can make a straight line by the use of a pencil and a straight-edge, or make a circle with a compass, but one must have a trained eye and skilled hand before he can become a successful artisan of any kind. The cut-and-try method is a thing of the past. The machinist, electrician, carpenter or worker in materials of any kind knows exactly what is to be done before he lays hold of a single tool. He sees the article or building finished.


Kerf
END VIEW EXAGGERATED
EDGE VIEW
B.
80°
G
X Y Z
RIP SAW
A.
C
D
E
CROSS CUT SAW
Set of teeth
EDGE VIEW
BACK SAW
COMPASS SAW
RIP SAW
STATE MANUAL TRAINING NORMAL PITTSBURG KS
SAWS and SAWTEETH
"A" = Point, "B" = Heel, "C" = Blade "D" = Teeth, "E" = Handle
"X" Y, Z" = Are equal for ordinary work, but will vary with hardness of wood "G" G "Cutting face, sharpened to alternate sides "G" Shaped to a point with 60° Δ Face







Shop sketching goes hand in hand with mechanical and machine drawing. Sketches are made in the form of working drawings which show the faces, or projection views, with measurements in detail for a clear explanation to the shop man in his work. The difference between free-hand and mechanical drawing is that the one represents the thing as it is seen, while the other shows the object in exact dimensional forms by the use of measured drawings. The one is essential to the other before either can be brought to its highest efficiency.

A notebook containing blue prints or sketches showing a development, step by step, of all shop projects is required in shop forging, bench work, etc., before the students are passed from the classes. This book serves the student as a constant reference for blackboard illustrations, etc., when he goes out to teach. All current and practical magazines such as *Electricity and Engineering*, *Engineering Record*, *American Machinist*, *Carpenter and Builder*, etc., contribute articles advocating this kind of drawing.

SHOP DESIGN.

The importance of the subject of design as one of the serious studies for the student in any of the various lines of constructional work is coming to be recognized. Whether one is to work in building, house furnishing, furniture making, iron work, or in any line in which objects are to be constructed, if his product is to be salable it must be of pleasing proportions and attractive appearance as well as of stable construction, and there are certain fundamental principles of design which may be applied to any constructed form in such a manner that they will tend, not only to emphasize the construction, but to make that form more attractive in appearance. This means that the spirit of art is brought into the work, through which the worker gives expression to his satisfaction in accomplishment, for it is the function of art to refine the beauty which lies in lines and spacings of an object and to give full expression to its structural elements.

The purpose of this course is to apply the fundamental principles of harmony in the art of design by giving the student the ability to express his ideas in art forms and to acquaint him with the possibilities and limitations peculiar to the various materials which are used in school work, as well as to give him an intelligent point of view, that he may modify decorations to meet the requirements of materials in various forms. He must have a knowledge and appreciation which will enable him to pass critical judgment upon articles which may be submitted to him for approval.

Concrete expression is given to principles of design through actual constructions of class problems in the school shops. The instruction is planned to supplement the work, such as fire irons, fireplace fixtures, candlesticks, lamps, gas fixtures, hinges, etc., in iron works; chairs, tables, costumers' writing desk, tabourets, etc.; shop equipment and school fixtures of various kinds.

We do not need higher education so much as we need a compelling force that will make us put into better practice the education we already have.—*A. A. Stewart.*

DRAWING AND DESIGN.

Course 13.—ELEMENTARY DRAFTING.

(*a*) A course in free-hand drawing which will give the student a facility in sketching that will enable him to make adequate representations before a class. The work is thoroughly practical in that it is mainly from type form models and machine parts relating directly to shop work. Lettering, outline drawing and simple light and shade; notes on history of architecture. One hour credit.

(*b*) Elementary Mechanical. Use and care of instruments; principles and simple conventions of drafting; isometric and cabinet projections; development of surface patterns and orthographic projections; shop sketching, and dimensioned drawings with the ability to read and make working drawings; lettering. While this course is for beginners, the student is brought directly in touch with drafting-room practice. One hour credit.

Course 14.—PROJECTION DRAWING.

The use and theory of orthographic projections as applied in the making of working drawings. Revolutions, developments and intersections. Shop layouts and inked drawings, tracings and blue prints. Working drawings will be made from free-hand sketches of models and machine parts. Special attention will be given to exactness, neatness, technique, and skill as required in the modern drafting room. This course should qualify the student for position as draftsman. Two hours credit.

Course 15.—SHOP DESIGN.

The principles of line, form and color are applied in designs in either wood or iron. Projects, both simple and elaborate, suitable for use in public-school work. The structural elements, lines and surfaces are considered in the design of problems which are directly related to the shop. The object of the course is to enable the student to make practical structural and artistic objects. Two hours credit.

Course 16.—TECHNICAL SHOP DRAFTING.

To prepare the prospective teacher. Shop drawings from free-hand sketches and from descriptions of required models with tracings and blue prints. Organization of outlines for courses in drafting for grades and high schools. Methods of procedure in class instruction, grading of work, equipment required, with suggested arrangement and approximate cost. Specifications, detailed and assembled drawings of shop equipment, checking and filing systems, tracings and blue prints. Particular attention will be given to technique, skill and speed. Two hours credit.

Course 17.—KINEMATICAL DRAWING AND GRAPHICS.

This course deals with the theory followed in practical work in transmission of power by means of belt and rope drives; cams; gears—annular, internal and bevel. The plotting of mechanical transmission of motions, graphical solution of problems in the determination of stresses in frames and trusses. Application of the principles involved. Two hours credit.

Course 18.—ARCHITECTURAL DRAWING.

A practical course in the reading and making of architectural plans. It bears directly on the requirements of the professional builder; whenever possible the study is related to some house under actual construction. Free-hand drawing to scale of standard molding and structural detail with architectural conventions and lettering, sketching of simple house plans with study of effective arrangement of rooms, openings, and conveniences; heating and lighting. Elevations of the house, with study of proportions, adaptations to the plan, treatment of form in relation to the structural demands. Any student who has had elementary architectural drawing is advised to substitute Drawing 31, Architectural Orders. Two hours credit.

Course 19.—MACHINE DRAWING.

The drawing of machine elements, bearings, hangers, and couplings with reference to shop construction. A study of the details of steam and gasoline construction to standardized trade drawings. Two hours credit.

Course 20.—ARCHITECTURAL DESIGN.

The design of a modern residence with reference to location, material, plan, convenience, health, heating and lighting, with complete working plans and specifications and estimate of cost; full- and half-sized details of construction of all special interior and exterior constructions; combined with the study of buildings under construction. It is expected each student will design a two-story house such as he would desire to build for himself. Other constructions, such as schoolhouse, barn or other buildings, may be included. Two or four hours credit.

Course 21.—MACHINE DESIGN.

Shop construction, school shop design and layout. Advanced problems in machine design. The application of equations of formulas to problems under construction, with a study of the materials used. Calculation of stresses and strains in the design of engines, etc. Sketching and drafting intricate machinery with assembled and detailed drawings. Bill of materials, tracing and blue print. Two or four hours credit.

Course 22.—DESCRIPTIVE GEOMETRY.

Intended for those who desire to specialize in mechanical drawing. Solutions of problems relating to point, line and surface, with intersections and developments and the applications in practical shop problems. This course gives a special training in the theory of orthographic and oblique projections, and is especially valuable to those who will study shades and shadows and linear perspective. Two hours credit.

Course 23.—SHADES AND SHADOWS AND PERSPECTIVE.

Casting of shadows and determination of shades in isometric and orthographic projections. Theory of perspective in application to architectural design. Intended to meet the requirements of students in interior decoration or general drawing. Exterior and interior views of buildings. Machines entire or in part. Two hours credit.

Course 24.—HOUSE PLANNING.

The evolution of the home; its relation to human life; individuality; the development of the American house. House planning; exterior and interior, with study of the various rooms and their arrangements. Different types of dwellings, with advantages or objections with reference to location; the student must become familiar with the plans of ordinary city and country houses and be able to utilize intelligently the sanitary and economical construction. He must have a fair knowledge of building materials and their relative values, and of building sites, with methods of contracting, purchasing and the finances of building a house. Two hours credit.

Course 25.—HOME DECORATION.

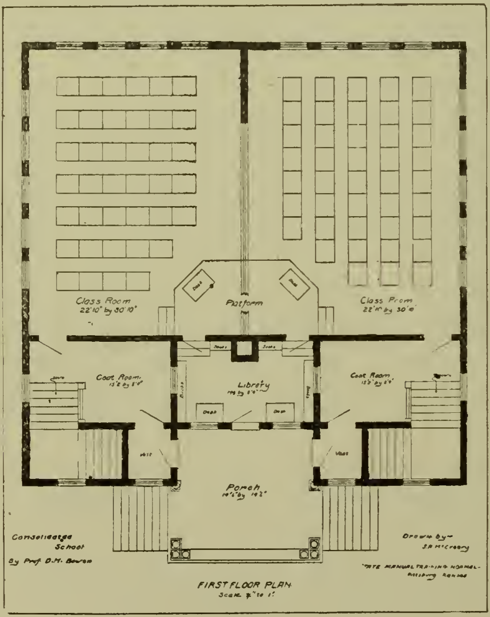
A study of color with relation to its application to designing of schemes of various rooms of the home. The principles of harmony in line value and color are applied to problems in wall paper, carpets, hangings and other decorations. The physical and psychological effects of color, with suitable schemes for walls, floors and ceilings. Studies of rooms in elevation plans and perspective. Complete interiors in color. Two hours credit.

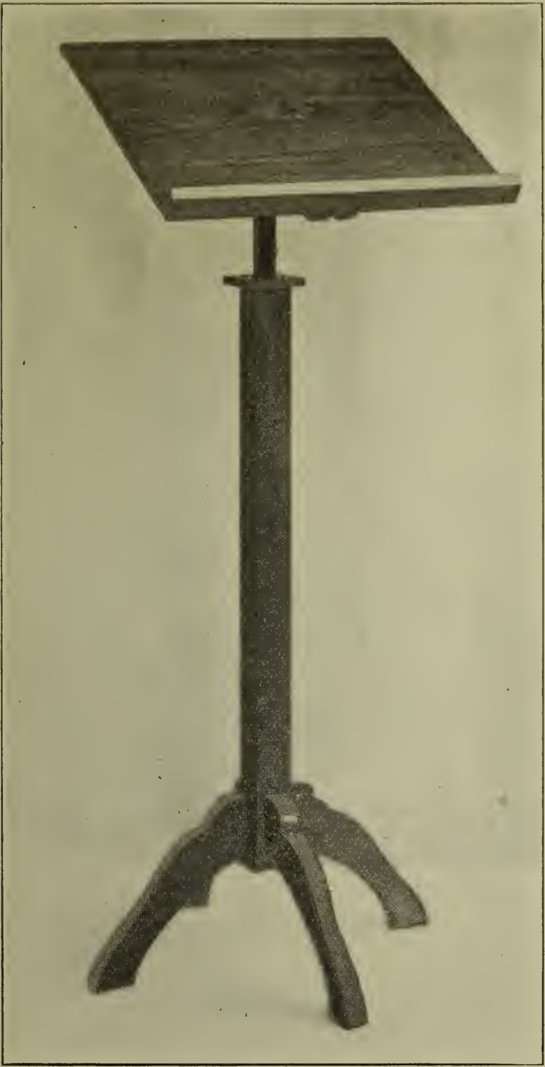
Course 31.—CLASSICAL ORDERS.

The student is required to draw the orders so he will accustom his eye to good architectural proportions. The drawings will be rendered in ink and color values. Designs are built up from compositions of details of the orders, giving ample latitude for exercising ability in design. Two hours credit.

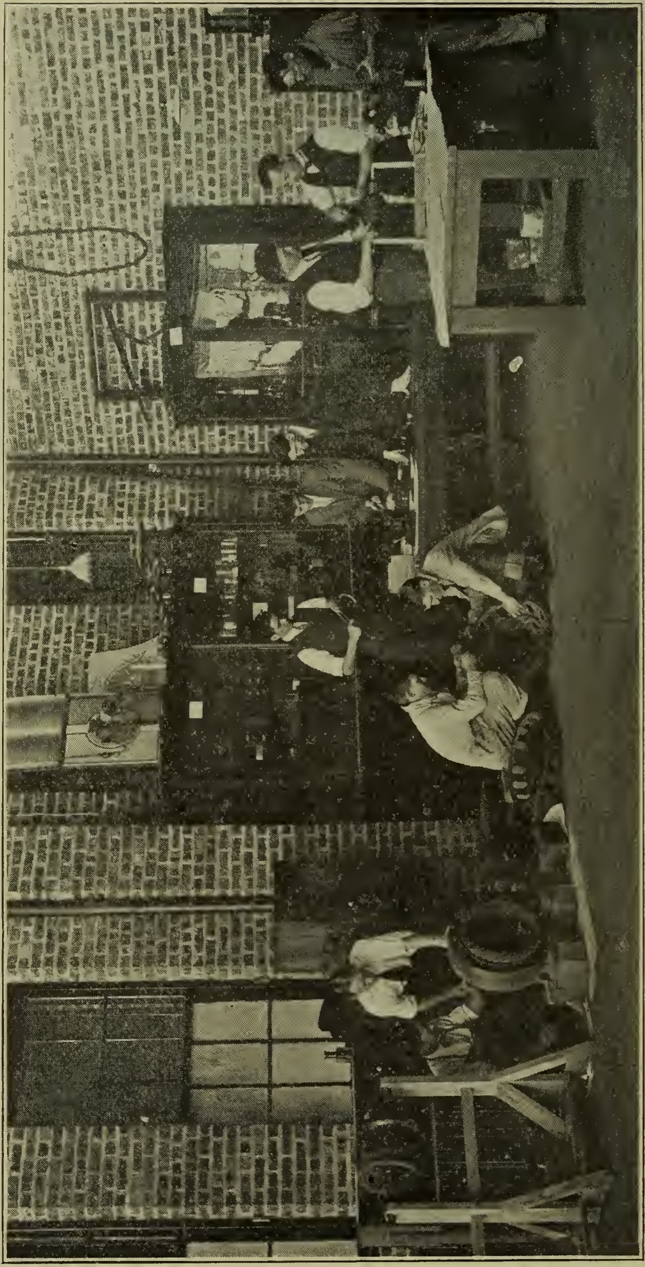
Course 32.—BUILDING DETAILS.

The purpose of this course is to make practical drawings such as are used in architectural construction. The drawings are made at different scales—½ in., ¾ in., 1½ in., and full-size—of interior and exterior finish for special problems in the field of frame structures for service to the mill men and on the buildings. Foundations, doors, sash, cornice, dormers, water table, porch, etc. Two hours credit.





Reading Stand.



Armature Winding Class at Work.

INDUSTRIAL PHYSICS.

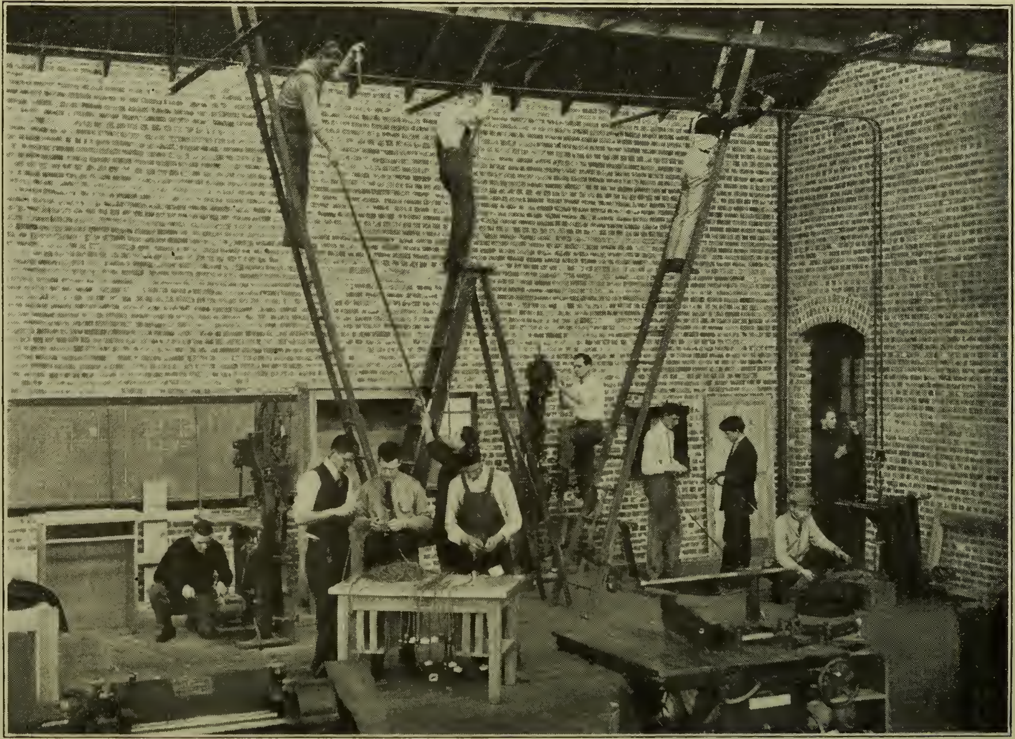
The changed content of the high-school course of study throughout the country, with the increasing introduction of practical and industrial subjects, has led to a demand for teachers whose preparation in such subjects as physics has included more of the practical and less of the purely theoretical phases of these subjects. Partly with the view to meeting this demand, and partly for the purpose of furnishing manual-training teachers with such knowledge and experience as will enable them properly to install and care for electrical machines, several courses are being offered in applied electricity. The first of these, electric wiring, consists of actual work in the wiring of buildings for lighting and power, both in open and conduit wiring, the installation and testing of lighting fixtures and motors, the location and correction of grounds and short circuits, and a study of the general rules laid down in the National Electrical Code.

The second course, direct- and alternating-current machinery, takes up the study of the principles underlying the operation of electrical generators and motors, together with the methods used in testing and measuring their output. The work is chiefly laboratory work in which the student is given machines of the various commercial types for study. He is required to connect them up and operate them, measure their input and output, check up their rated horsepower, and determine their efficiency. A part of the course is given to the study of the care of such machines, and the methods of locating and correcting the troubles to which they are liable.

In addition to the courses outlined above, a course is offered in the winding and repair of armatures for dynamos and motors. This course is given under the direction of a practical electrician, and consists altogether of laboratory work upon commercial machines. Damaged machines are procured from various sources, taken apart, the trouble located, and the armature either rewound or such repairs made as are necessary to put it into first-class condition. The parts are then assembled and the machine tested out. This course furnishes an unusual opportunity to those students who must deal with electrical machinery in their teaching, since there is hardly another normal school to be found which offers such a course.

In addition to these courses, courses are given in industrial physics, household physics, mechanics, and plumbing.

Innumerable men and women had seen the kettle boil, but it occurred to only one that the force which lifted the lid might be confined and made to do human service. The man finds or makes his opportunities, and in turn they help to make him.—*Bishop Spalding.*



Electric Wiring Class at Work Lighting Room.

INDUSTRIAL MATHEMATICS.

There is so much of life that is quantitative in character, and there are so many relations of magnitude existing throughout the world about us, that mathematics can not help touching the affairs of practical life at so many points as to make it a most necessary part of any educational program or course of study. It is true that the amount and the type of mathematics necessary for the successful prosecution of different lines of work are widely different. Some vocations are almost nonquantitative in character, while, on the other hand, others are extremely quantitative, and the individual who successfully follows such an occupation must be very well equipped with the different branches of applied mathematics. Most of the engineering professions belong to this latter class, and consequently those institutions which have as their aim the preparation of technical men not only insist on rigid mathematical entrance requirements, but also include from two to three years of mathematics in their college courses. At the present time there is a growing tendency to reduce all knowledge to a quantitative basis, and many subjects which were formerly given without this exactitude are now demanding a familiarity with mathematics which can only be acquired by an extended course in this field of activity. Many so-called "trades" are losing their elementary character, and the young man who aspires to become proficient in them is confronted with a greatly different situation than confronted his father when he began his apprenticeship. Modern power machinery is more and more taking the place of human physical power, and the workman is expected to use his mind to direct and operate, rather than to apply his bodily strength directly to the tasks before him. To meet this new condition, industrial and trade schools have been established, and also much similar work has been incorporated into the regular school system. Gradually these courses are being developed and standardized until they are ranking equal with the historic courses in the developing of the individual as a useful member of society. The traditional courses may be suited to the development of the pupils who come from homes of comparative culture, and furnish a fairly adequate field for the cultivation of their natural endowments. But to the children of a poorer heritage, these subjects are inadequate, since these children do not have the wealth of perhaps several generations of familiarity with the best in the world's history, literature, and art. Their habits and attitude toward life were not in keeping with these subjects which they were called upon to master and assimilate, and even though they might have strength of mind, and apply themselves painstakingly, the results were often not commensurate with the effort. We are thus forced to the conclusion that the historic school curriculum was ill adapted to develop their useful capabilities and make them of the highest social and civic usefulness. New courses of study for them become imperative, and to-day we are developing such courses in a manner and with a rapidity which soon ought to place them on a footing wholly equal to the older subjects of study. In the development of these industrial courses to subjects of high rank the quantitative aspects of them must be emphasized, and they must be so given as to develop the habits of exactitude and accuracy in this day and age of efficiency. Mathematics will thus continue to be an important part of the school curriculum, because it is for the training of the student in calculative processes. The fundamental subject matter of arithmetic, algebra, geometry and trigonometry will never be bodily dropped from all courses, but only from such ones as can not be reduced to this quantitative basis. Such courses will be in the minority, and all or part of these branches of mathematics will be included in the different groups according to the needs of that particular type of work. Much of the content of these mathematical courses must be carefully evaluated in terms of social utility. Every topic and subtopic within any of these studies should be subjected to the test of whether the knowledge and skill gained from it will function anywhere either in actual life or in some topic of more advanced mathematics which is itself a social utility. The courses given at most of the engineering and technical schools contain much that does not function in the work of such schools, and is given generally because the teachers of mathematics themselves have been trained to the idea of making each subject lead to the following mathematical subject, and have spent little or no time in examining the problems which their students must meet in their further technical study or in their career as a practical engineer.

Even worse has been the relation of mathematics to the industrial work of our high schools. Very little attempt has been made to correlate the work in mathematics to the problems of the shop or laboratory. The student is kept on the formal exercises of algebra and geometry, with many problems which will never have any direct relation to his life, either in school or after entering upon his business or vocational career.

It is the proper function of a normal school to develop such high-school courses in connection with its high-school department, and to prepare teachers in its college department who will go out imbued with the spirit of coöperation which will make them useful in the proper correlation of all subjects in the curriculum, and especially in the evaluation and development of their own particular lines of activity.

Such courses in mathematics are now being evolved under the title of "applied mathematics" or "industrial mathematics." Since they are in the formative process, there are few books available which are directly in line with this ideal, and consequently the material submitted to the class must be gleaned from a variety of sources. This condition demands well-trained teachers, not only in mathematics but also in the related fields of activity in which they should function their work. Such teachers are being prepared to meet this demand, and to those who acquire this broad preparation, opportunity stands waiting to lead them into a field of activity and usefulness.

3 0112 105654922